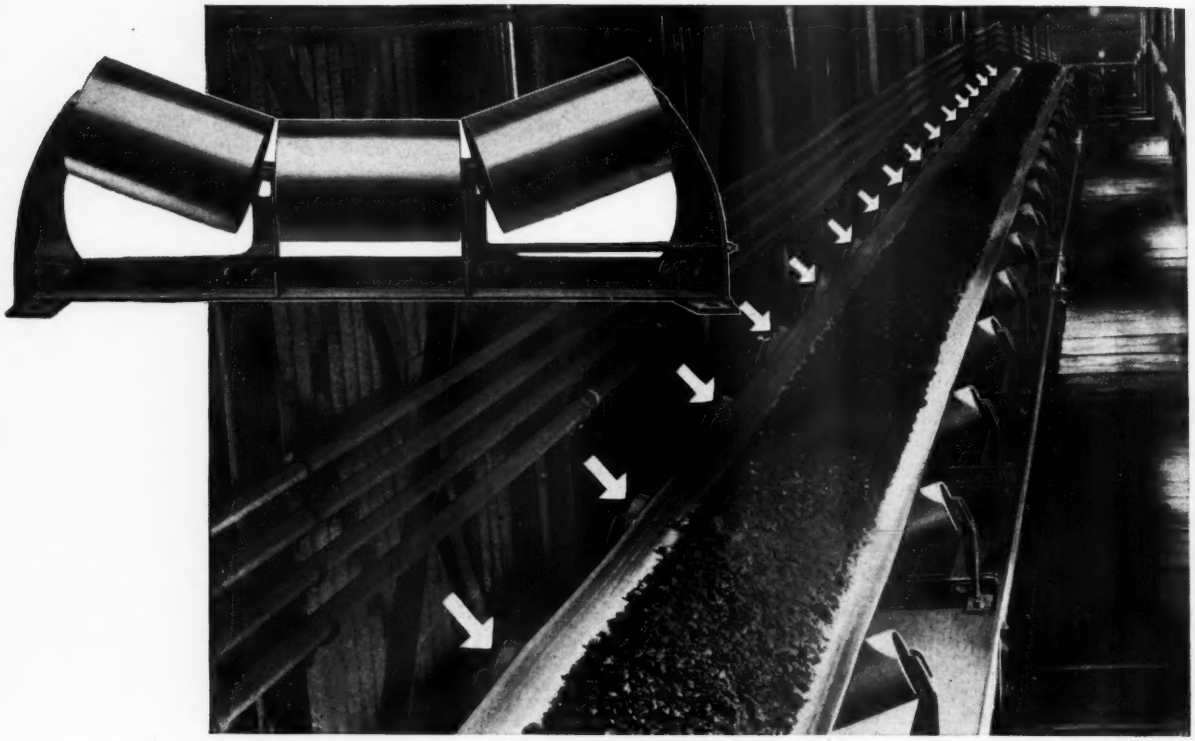
Mining CONGRESS JOURNAL



Link-Belt Standardized Design Cuts Belt Conveying Costs

In the Link-Belt "100" series belt conveyor idlers, we believe that we have achieved the ultimate in design and performance, with evolution of engineering features progressively since 1896. These features cut conveying costs by reducing maintenance, giving longer service, and permitting the greatest simplification.

In addition to idlers, Link-Belt builds a great variety of standardized design conveyor elements and accessories such as: belt and apron feeders for uniform loading; trippers for intermediate discharge or distribution; drives using gears, reducers and chains; terminal machinery; supporting structures and enclosures.

We are at your service for complete conveyor systems, or individual equipment, to suit your requirements.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Atlanta, Dallas 1, Minneapolis 5, Denver 2, Kansas City 6, Mo., Los Angeles 33, San Francisco 24, Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Vancouver, Toronto 8.

11,213

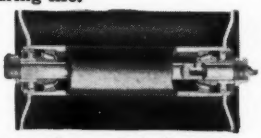
LINK-BELT

THE SYMBOL OF QUALITY — LINK-BELT

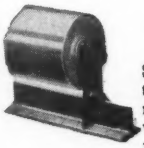
BELT CONVEYOR EQUIPMENT

IDLERS • TRIPPERS • BELTS • PULLEYS • BEARINGS • DRIVES

Grease-in—Dirt-out Seal prevents harmful foreign matter from reaching bearings — conserves lubricant — prolongs bearing life.



Rolls made with smooth rounded-edge outer shell of uniform thickness, and a full-length steel central tube, both continuous-welded to dished steel heads to form sturdy, well-balanced integral units.



Strong Brackets Support the Rolls

Supporting brackets are tough malleable iron in reinforced T-section to withstand load and impact.

Interlocking Nuts and Yokes Prevent Brackets from Spreading

Impact Idlers with Rubber Treads

Interchangeable with steel rolls this type provides a Cushion at loading points to protect idlers and preserve the belt — A good investment where heavy lump materials are handled.

SIZE

MAKES NO DIFFERENCE...

NOW, ALL S-D 1-2-3 "AUTOMATICS" ARE COMPLETELY SEALED...

Whether it's a 1½ or 30 ton car, all S-D 1-2-3 "Automatics" are now completely sealed against coal dust leakage. Because of a simple "Dust-Roof" seal over space between doors and frame, and with a new patented sealed hood over wheels, coal dust cannot sift down onto tracks with S-D "Automatics." These dust sealed cars save operators thousands of dollars every year in track clean-up costs. SIZE MAKES NO DIFFERENCE. For example, the 8-wheel S-D "Automatic" above is 30 ft. long, 8 ft. wide and 6 ft. 2 in. high above rails, and hauls 25 tons of coal. The other car with 12 ft. sides, 6 ft. 4 in. width and 20 in. height, hauls 2 tons of coal. Both are completely sealed.

CONDITIONS MAKE NO DIFFERENCE. All S-D "Automatics" are custom built to meet your requirements. Only fundamentals are the same. Each car automatically discharges its load . . . dumping on the move, and can fill your bin level in case of breakdown beyond the bin. Each car has the exclusive S-D, safe, under-the-car Jerk-out latch mechanism. S-D "Automatics" lead a comparatively easy life and repairs are seldom required because they are not subjected to the damaging strains of being lifted or turned over for dumping. For more actual dollar returns on the investment, S-D "Sealed Automatics" are, by far, your best buy!

25 TON
5 TON
10 TON
30 TON
6 TON
12 TON

Sanford-Day Iron Works
KNOXVILLE TENNESSEE

The Tiger Brand Specialist says-

"Here's what you should know about wire rope —and how to select, use and care for it."

THE three most important qualities that wire rope must possess are (1) strength, (2) fatigue resistance, and (3) abrasion resistance. Whether the rope is used on hoists, cranes, excavators, conveyors, loaders or unloaders, these properties are required in varying degrees depending on serivce requirements.

STRENGTH—This is determined by size, grade, and construction. Wire for wire rope can be made in any desired tensile strength ranging from iron grade at approximately 100,000 lbs. per sq. in. to improved plow steel grade at approximately 250,000 lbs. per sq. in. The knack of making Tiger Brand Ropes with uniform strength throughout shows the skill of the wire rope manufacturer.

FATIGUE RESISTANCE—The ability to make wire that will stand thousands of bends over drums and sheaves without breaking is no small accomplishment. The wire must be made with just the right amount of toughness and ductility. Tiger Brand Wire Rope is made from wire especially fabricated for wire rope use. Ropes composed of a large number of small wires will have higher fatigue resistance than those made with a smaller number of large wires.

ABRASION RESISTANCE—This is determined by the size and chemistry of the wires, especially the outer wires as they are exposed to the most wear. Obviously, the larger the wire size the greater the resistance to abrasion. Furthermore, the high strength steels are better able to withstand wear because of a greater carbon content. This means that improved plow steel ropes would have the highest abrasion resistance.

Getting the right balance

Individually, the properties of strength, fatigue resistance, and abrasion resistance are not difficult to obtain . . . but in wire rope making, it is impossible to accent one property without detriment to the other two. That's why the skill and experience of the men who make Tiger Brand Wire Rope are so important. Satisfactory performance demands that running ropes possess all three properties and therefore it is necessary to obtain an effective balance which meets the requirements of your particular job.

How to get longer wire rope life

Don't overload the rope.

Don't subject the rope to sudden impact loads.

Don't use undersize sheaves and drums—this is the commonest cause of fatigue breaks.

If vibration is present, make regular cuts from the end of the rope so as to change the dampened section.

Keep groove diameters proper size so as to avoid pinching of rope.

Avoid flange wear as a result of bad sheave alignment.

If grooves become fluted, it is usually a sign that the sheaves should be replaced with a harder material.

Lubricate regularly. Wire rope is a machine and requires adequate lubrication. It must also be protected from corrosion to retain strength.

Avoid kinking, improperly attached fittings, and uneven drum winding.

Make use of the Tiger Brand Wire Rope Specialist

It is very much to your advantage and to ours to maintain good operating practices. Call in the Tiger Brand Specialist at regular intervals and have him give you a FREE Check-up. He is thoroughly experienced in proper wire rope application.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Send for FREE BOOKLET

American Steel & Wire Company
Rockefeller Building, Dept. N-30
Cleveland 13, Ohio

Please send me a copy of your catalog, "American Tiger Brand Wire Rope."

Name.....

Company.....

Position.....

Address.....

City.....State.....

USS

AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

How to cut loading time and repair costs...

SUPERLA Mine Lubricants have reduced loader-clutch repair costs as much as 50% in midwest mines. They have eliminated delays for "warming up" loaders. They have made possible easier and faster loading. Here's why they will assure similar benefits for you:

Superla Mine Lubricants keep transmission cases clean. Clutches operate easily with no gumming or coking caused by oil deposits. When machines are started, these lubricants flow readily between clutch plates, *protect them against wear, eliminate "clutch drag" and the necessity for warming up loaders.* During long periods of continuous operation, Superla Mine Lubricants do not thin out excessively, provide safer lubrication for clutch plates.

A test of Superla Mine Lubricants will prove their ability to keep your loaders on the job longer with less maintenance. These products are available in oil and grease grades suitable for any type of cutter or loader. A Standard Oil Lubrication Engineer will gladly help you select the proper grades for your equipment.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

SIX GRADES FOR LUBRICATING ANY TYPE OF CUTTER OR LOADER

No. 00. An oxidation-inhibited oil containing a detergent additive. It provides exceptionally clean operation and low oil consumption for oil-lubricated gear cases.

No. 0. A high-quality additive-type oil similar to No. 00 but of a slightly heavier grade. It is designed for Goodman loaders and cutters.

No. 2. A soft, semi-fluid grease for lubricating gathering-head gear cases where greater fluidity is desired than that usually provided by most loader greases.

No. 4. A semi-smooth grease particularly resistant to thinning out under heat and mechanical working. At the same time it can easily be poured from the barrel bung at ordinary mine temperatures. It is especially designed for Joy loaders.

No. 6. A grease of heavy consistency and good high-temperature characteristics. Its fibrous structure makes it particularly useful on mine car wheels and for general underground lubrication.

No. 8. A smooth grease having superior high-temperature characteristics. It is suitable for armature bearings and pressure-gun work where a grease of heavy consistency is desired.

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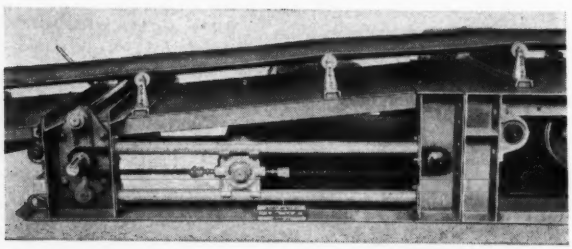
ONLY ONE FIRM TAKES FULL MINE CONVEYOR PERFORMANCE

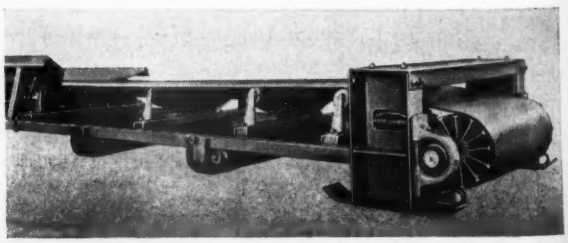


TAIL SECTION

Telescopic type to provide tail takeup action. Easy to clean out—no steel work under tail pulley. Has transverse cover to protect pulley, bearings *and belt*. Strong enough so you can rest a feeder on it.

INTERNAL TAKEUP

Located directly back of the drive. Handles 10′ of belt slack. Operated by reversible ratchet-wrench working on gear reduction to minimize manual effort. Double-acting pawl prevents backing-up. Worked from either side of conveyor.



RESPONSIBILITY FOR COMPLETE

. . . only HEWITT-ROBINS makes and guarantees both machinery and belt

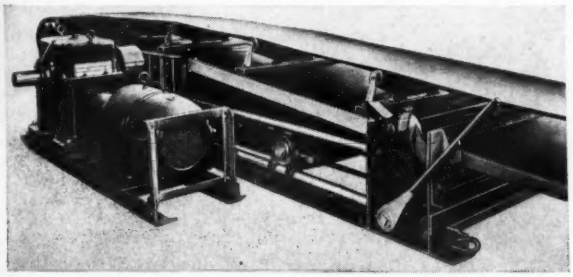
No longer need you worry about your Mine Conveyor operation—wondering who will be responsible for the successful, *lasting* performance of its machinery *and belt.*

Get your Mine Conveyor from Hewitt-Robins. Here is a company—the only company in all the world—able *and willing* to take complete *unified* responsibility for the installation. For only Hewitt-Robins makes both machinery *and belt.*

The machinery is the sturdy, strong, substantial construction made by the Robins Conveyors Division and installed in all the better mines. The belt is the famous Division Ajax® Underground Belt—with mildew inhibitors and acid neutralizers compounded in its wear-resisting rubber covers and high tensile fabrics in its enduring carcass—made by the Hewitt Rubber Division.

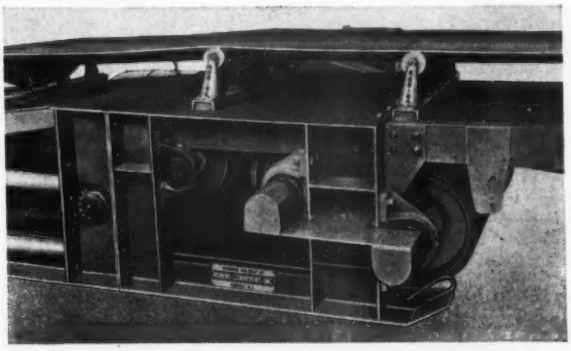
Yes, when you buy a Hewitt-Robins Mine Conveyor you get not only the best elements —machinery and belt—that your money can buy; you also get the satisfaction and peace of mind that come from having one unified source guaranteeing successful performance.

Hewitt-Robins Mine Conveyors can be shipped complete—machinery, belt, motors, reducers and drives—out of stock from Passaic, N. J., and Charleston, W. Va., in belt widths 26", 30" and 36", any desired length. For immediate delivery, get in touch with Hewitt-Robins, Inc., 1010 Pennsylvania Ave., Charleston, W. Va., or 270 Passaic Ave., Passaic, N. J.



UNIFIED DRIVE SECTION

Motor, reducer and controls mounted on a single base—skid-designed for easy moving about. Can be located on either side of the conveyor. Drive reversible—incoming for men and material, outgoing for high output of product.



SINGLE OR TANDEM DRIVE

Hewitt-Robins Mine Conveyors come equipped with *both* single and tandem pulley drive elements. Provide ample horsepower for lift and length up to the very limits of belt capacity. Reeving of belt handles level, uphill or downhill service requirements.

HEWITT-ROBINS
MINE CONVEYORS

HEWITT-ROBINS (HR) **INCORPORATED**

BELT CONVEYORS *(belting and machinery)* • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

Strip mine speeds coal recovery

How "Nitramon"* helped simplify a tough shooting problem

The Bailey Construction Corporation had to remove a heavy sandstone overburden in a West Virginia Strip Mine. Here is the blasting plan worked out in cooperation with Du Pont Explosives representatives:

The drilling pattern called for two rows of well drill holes—the first, 32 feet back from the toe; and the second, 20 feet behind the first. Space between holes averaged 21 feet. The shot illustrated contained 57 holes averaging 65 feet deep. Each hole was loaded immediately after drilling and the shot contained 44,700 lbs. of Du Pont "Nitramon" No. 2.

Good results after the blast. More than 40% of overburden thrown clear of coal seam; excellent top breakage, and low muck pile.

"Nitramon," the safest blasting agent, was recommended and adopted for this job because of its safety and economy. Unaffected by a blasting cap, friction, or impact, it is detonated with relatively insensitive "Nitramon" primers initiated with "Primacord." It is the only blasting agent adapted to loading holes that must stand for long periods before firing ... and loading right after drilling avoids expensive cleaning and redrilling of holes.

Whatever your blasting problems, plan to call in your Du Pont Explosives representative. His long experience and technical knowledge can help you determine the safest, most economical, most efficient procedure to follow. He's a good man to know. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

UNDERGROUND IT'S...

Du Pont Permissibles

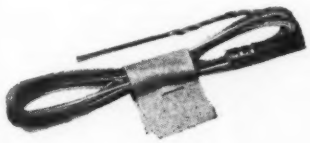
• • • • • • • • • • • • •

"Monobel" AA—Best-selling permissible. Economical producer of lump coal . . . has good water resistance.

"Lump Coal" C—Has a slow, heaving action that pushes coal out away from the face . . . makes for easy loading.

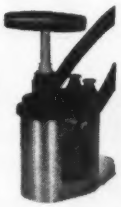
"Gelobel" C—High velocity gelatinous permissible ideal for hard rock and slate work. Unaffected by wet conditions.

DU PONT ELECTRIC BLASTING CAPS



Exclusive safety features:
Nylon-insulated wire—Rubber plug closures—Aluminum foil shielded shunts.

DU PONT MULTIPLE-SHOT PERMISSIBLE BLASTING MACHINE



Compact. Sturdy. Water-resistant. A ten-cap unit of the twist type.

*Reg. Trade-mark for nitrocarbonitrate blasting agent

Listen to "Cavalcade of America" Tuesday Evenings—NBC

DU PONT

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

DU PONT EXPLOSIVES

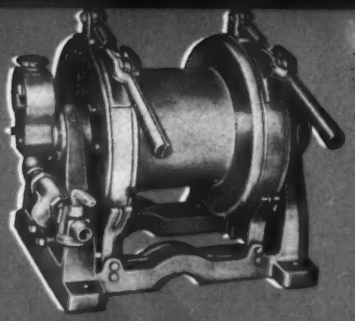
BLASTING SUPPLIES AND ACCESSORIES

JOY L-111 Hoist, powered by JOY's reversible "Pistonair" Motor

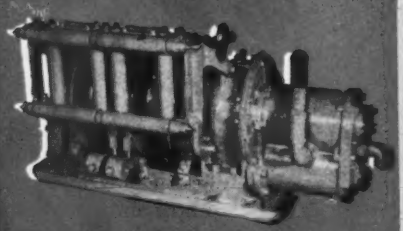
JOY SINGLE DRUM HOISTS

More for your money in every way!

- ★ **More Compact**
- ★ **Lighter Weight**
- ★ **Greater Power and Efficiency**
- ★ **Simpler Operation**
- ★ **Easier Installation**
- ★ **Greater Endurance**
- ★ **Minimum Maintenance**



Above, JOY E-112 Hoist, with a 5 H.P. JOY exclusive "Turbinair" motor. Can be mounted on a car, timber, column or bar for every type of hoisting job.



Above, JOY FF-211 Slusher, for all-purpose scraping jobs. Illustrated with 10 H.P. "Turbinair" motor, but features interchangeability of drives to suit conditions.

Left, JOY AW-80 Air Winch, a compact, rugged, flexible hoist for every small job. Weighs only 85 lbs., will lift 500 lbs., is powered by reversible piston-type motor.

JOY C-111 heavy-duty Shaft Hoist, with a 50 H.P. slip ring motor. Can be diesel-driven if desired. Lifts 5000-6000 lbs. at speeds up to 300 ft./min.

Specify "JOY"

for every HOIST or SLUSHING JOB

. . . air-powered or electric

WRITE FOR BULLETIN, OR *Consult a Joy Engineer*

W&D M2438

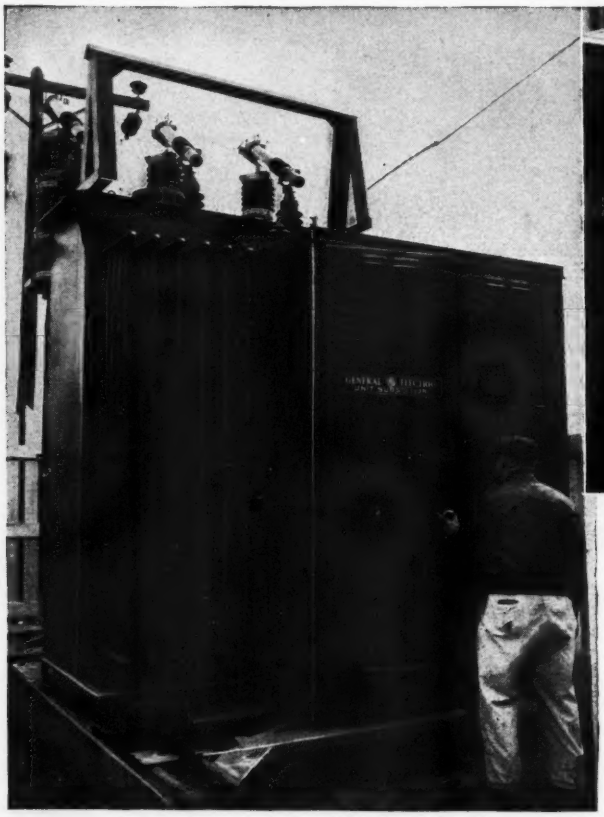
JOY MANUFACTURING COMPANY

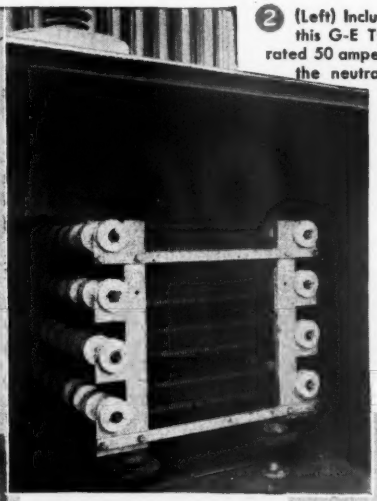
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

"We're sold on it!"

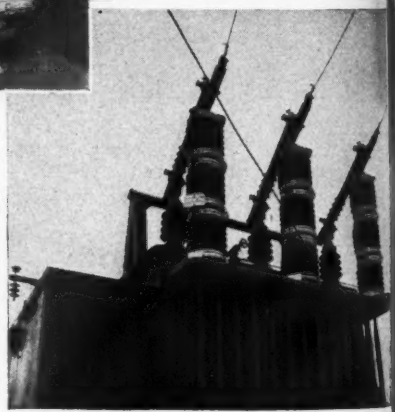
"THAT'S WHY WE'RE INSTALLING THE SAME SETUP IN ANOTHER STRIP MINE."





(2) (Left) Included in the unit substation is this G-E Type EW grounding resistor, rated 50 amperes continuous, for grounding the neutral of a 4160-volt circuit. It eliminates the hazard of high-voltage shocks resulting from undetected shorts.

(3) (Below) Installed on the 33 kv incoming line of the unit substation, these 3 sets of G-E Thyrite station-type lightning arresters are each rated 34.5 kv. Compact and of simple design, these G-E arresters have a record of excellent protective efficiency in preventing system disturbances or outages.



(1) (Left) Here is the Harmattan Mine's G-E outdoor-type, skid-mounted unit substation, rated 1500 kva, which steps down incoming power from 33,000 to 4160 volts. Because the G-E power distribution system keeps the voltage drop to a minimum, the equipment can operate farther from the substation, thus resulting in less frequent moving of the substation.

GENERAL ELECTRIC

Complete General Electric power distribution system helps minimize shutdowns, reduces delays and accidents, cuts costs, says Mr. L. E. Briscoe, Electrical Engineer of Fairview Collieries.

At the new coal-stripping operation of the Fairview Collieries Corporation at the Harmattan Mine near Danville, Illinois, a complete, co-ordinated General Electric power distribution system was recently installed, comprising unit substation, cable, and cable-skid switch houses. As a result, according to Mr. L. E. Briscoe, electrical engineer in charge, "We are *sold* on this type of power distribution system and are installing the same setup in another strip mine that we are modernizing."

Let Mr. Briscoe explain why:

"A dependable power distribution system," he says, "helps keep shutdowns to a minimum, which is the key to successful dragline operation. By using cables instead of overhead lines, power lines can be kept out of the way and advance with the operating equipment. This eliminates many accidents and delays, and provides big savings in money.

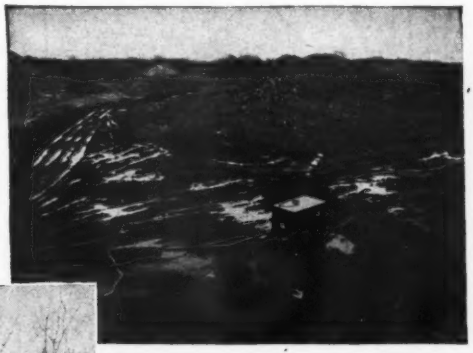
"The flexibility of our G-E system is due to (1) use of standardized equipment, (2) use of polarized couplers which permits interchanging cables, and (3) the ease and speed with which the cables can be interchanged.

"The G-E power distribution system also provides for testing ground continuity of each 4160-volt incoming and outgoing cable on the hill-type cable skids. This assures that the ground protection system is always working, does away with testing the cables by bells or other methods, and saves us valuable time."

Advantages such as these—plus additional savings in power costs and relocating time and costs—can be yours with a completely integrated G-E power distribution "package." It's worth your while to check the facts with a G-E mining specialist. Call him—today. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

4 (Above) The Harmattan Mine uses 9 of these G-E portable, cable-skid switch houses to serve its surface mining equipment. They provide maximum portability and convenience plus more selective tripping. For safety, the G-E system is designed to have at least two protective breakers between each piece of operating equipment and the unit substation.

5 (Below) This interior view of one of Harmattan's hill-type cable-skid switch houses shows the power circuit breakers, rated 25,000 kva interrupting capacity, 3 phase, 60 cycle, 5 kv maximum; together with a 6-volt battery and a G-E Type SB-1 switch for testing ground continuity.



6 (Above) G-E cable-skid switch houses are metal-enclosed and sturdily built to provide maximum service continuity under conditions such as shown here. At Harmattan, G-E portable cable—all of the same type for easy interchangeability—is used exclusively.

Power Distribution Systems

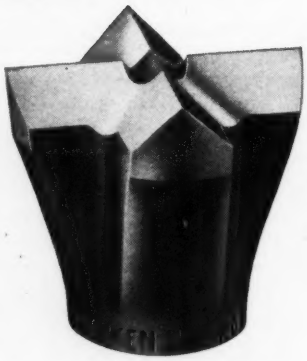
—to cut mining costs per ton!

Now! TIMKEN® offers all 3 rock bit types...and a complete Rock Bit Engineering Service!

WHATEVER type removable rock bit your job requires, the Timken Rock Bit Engineering Service can help you select it. Since Timken® makes *all three* types of rock bits—multi-use, carbide insert, and one-use—Timken Rock Bit Engineers have a *complete* selection to draw upon in meeting your drilling needs. With these three types, and a wide range of shapes and sizes, the Timken Rock Bit Engineering Service can give you the bit performance your job demands, whether it be lowest bit cost, lowest cost per foot of hole, greatest possible drilling speed, or any other desired advantage.

Among the three Timken rock bit types shown here is the *one best bit* for your job. To be sure of getting it, consult the Timken Rock Bit Engineering Service.

1. MULTI-USE



Long the quarrying, mining and construction industry's basic removable rock bit, the Timken multi-use bit gives lowest cost per foot of hole when full increments of steel can be drilled and when good control over bit reconditioning can be maintained. Low in cost, it requires less policing than carbide insert bits. Timken multi-use bits are available in 13 series, in a wide range of shapes and sizes.

2. CARBIDE INSERT

Under certain conditions—including extremely hard and abrasive ground, small holes, and unusually deep holes—Timken carbide insert bits frequently offer many advantages that may more than make up for its extra unit cost. Drillers change bits less often. Holes go down faster. Reconditioning is simplified. Timken carbide insert bits are available in 4 series, in a variety of shapes and sizes.

3. ONE-USE SPIRALOCK

Designed for use where reconditioning is impractical or undesirable, Timken one-use "Spiralock" bits offer lowest unit bit cost. New "Spiralock" union simplifies steel preparation, makes steels last longer, holds bit on dependably yet permits easy removal. Has crowned chisel pilot for easy collaring, fast penetration. Two series in a variety of sizes.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

... your best bet for the best bit ... for every job

FREE BOOKLET! *Everyone who buys rock bits should have a copy. Gives full information on all three types of Timken rock bits and the Timken Rock Bit Engineering Service. Shows full line of bits in actual-size photographs, with detailed descriptions. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".*

It's Butyl-Insulated!

SECURITYFLEX type SHD

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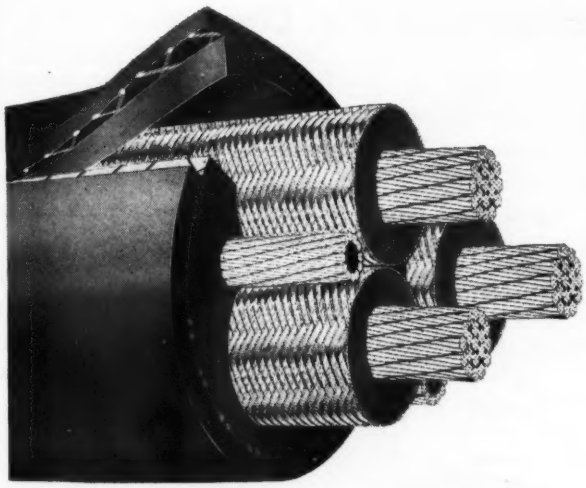

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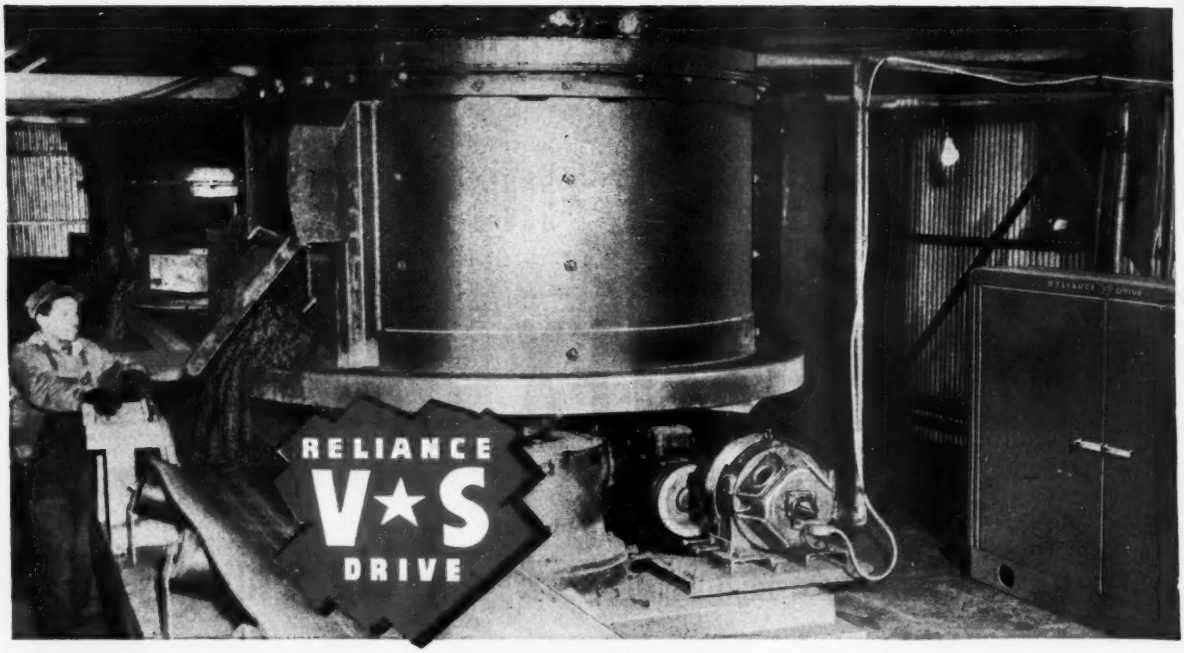

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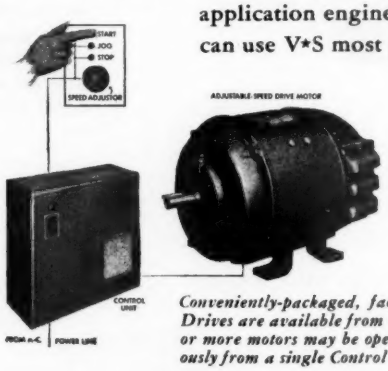

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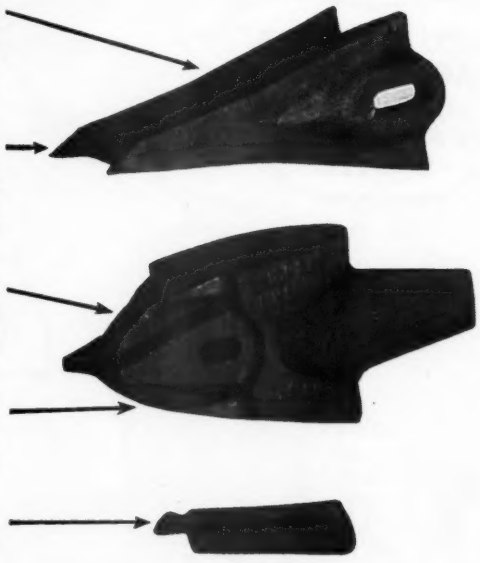

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Mining CONGRESS JOURNAL

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Trouble Can Wait?

WE say it *can't!* The Administration marked time for weeks while no coal was being produced and supplies dwindled. The Taft-Hartley Act, designed to avert threatened emergencies, was by-passed and then, too late for most effective use, was invoked to deal with an existing crisis.

Schools and churches in some areas prepared to close and residents in many sections of the country were urged to reduce power consumption. Deterioration of the coal situation, almost to the point of government seizure, was encouraged by the "lie low and wait" attitude.

Watchful waiting seems to be one of the guiding policies of the White House. Repeated strikes, increasing unemployment, unwieldy farm surpluses, staggering budget deficits and other major issues exhibit mushroom-like growth under this passive attitude.

In a similar manner, this waiting game can lead directly to serious shortages of minerals and metals. Already the pressure of unjust taxation has caused a decline in the mining activity and new development essential to provide the raw materials required by a growing nation. Although the facts of the case indicate the need for upward revision of depletion allowances, and constructive amendments in other mining tax provisions, Administration proposals would instead place greater tax loads on mining.

In February the Committee on Ways and Means of the House of Representatives heard a series of potent arguments for tax revision. One witness pointed out that for the period 1928 to 1946 inclusive, the coal mining industry had a net loss of $71,794,000. During this 19-year period, total depletion allowances were $424,425,000 of which $290,000,000 were on returns with net income and $134,500,000 were on returns with no net income. Obviously a significant amount of the depletion was not recoverable from income. Hence, the allowable rate should be sufficiently high to enable the recovery in profit years to offset the failure to make recovery in loss years.

With respect to sulphur, potash, trona, talc, phosphate, barite and other industrial minerals it was brought to the attention of the Committee that percentage depletion had provided the incentive to exploration and development that has resulted in assured supplies of these important nonmetallics.

Likewise, in regard to metals, depletion recognizes that the business of mining consumes a portion of the capital, and that the part consumed should not be taxed. This principle is reflected in depletion rates fixed by the Congress in 1932. Since then the difficulty and cost of finding new mining properties has increased.

One witness reported significant figures on metal mining in Idaho for the 11 years 1930 to 1940. Total gross income of $210,000,000 exceeded expenditures, other than taxes and assessment work, by only $15,000,000; taxes took $17,000,000, assessment and location work $8,000,000, leaving an excess of total expenditures over income of $10,000,000.

These data show conclusively how vital percentage depletion is to perpetuation of the mining industry. If the rules of the game are to be changed in accordance with Administration proposals, industry will be unable to justify future investment in mining. Likewise, application of the "waiting" policy with regard to needed tax revisions will imperil the future availability of minerals. A liberalization of the tax laws applying to mining is vital if we are to restore incentive to seek and develop new mines, and to maintain a vigorous mining industry for the future welfare and security of the country. To wait until a mineral raw material shortage develops is perilous. Action is needed now! This "trouble" can't wait.

Britain's Choice

IN February Great Britain held a general election that resulted in 315 of the 625 seats in the House of Commons going to the Labor Party—a slim and unworkable majority over the 297 seats held by the Conservatives and affiliates. Other opposition parties hold 12 seats and one nonvoting seat is held by the Speaker of Commons.

Under the British system, the Prime Minister depends for his authority upon the support of a majority in the House of Commons. When he fails to command a majority, the matter may be again referred to the people in the hope that a new election will give an explicit mandate to one of the rivals, or a coalition government will be formed.

Any conclusions as to the result of another election, if one is held, would be premature, but the closeness of the February 23 voting signifies the end of further nationalization of British industry for the present. This swing to the right is most gratifying and indicates that a large portion of Britain's people are not yet ready to go "whole hog" for the illusory "benefits" sought after by shackling themselves to socialism.

Drilling in the Hoosac Tunnel

Seventy-Five Years of Rock-Drill Progress*

An Account of the Development of an Effective Production Tool

By M. L. McCORMACK
Manager, Rock Drill Department
Ingersoll-Rand Co.

IN AN average year, the United States produces about 3½ billion dollars worth of minerals, most of which could not be economically mined without the mechanical rock drill. The mineral industries alone pay annual wages of around $250,000,000 for operations in which drilling and blasting are done. Impressive as these figures are, they tell only part of the story of the importance of excavation in our modern way of living. Other huge sums are spent for highways, dams, railroads, subways, hydroelectric plants, irrigation and water supply systems, and kindred works. To single out merely one of these undertakings, the Delaware Aqueduct is being driven through 85 miles of rock at a cost of $300,000,000 to augment the water supply of New York City. To projects of this type we must now add the enormous underground storage and defense program of our Government.

The rock drill spearheads the attack in rock excavation. To obtain a clear-cut picture of what it has contributed to the emancipation of workmen, we have only to refer to Pliny's description of what was apparently the first long tunnel ever driven. This 3½-mile bore that drained Lake Fucino in the Italian province of Aquilo was constructed in A. D. 52, during the reign of Emperor Claudius. Forty shafts and numerous inclined galleries were sunk to depths as great as 400 ft, and through these broken materials were hoisted to the surface in copper buckets that held a little more than one cubic foot each. It is said that 30,000 men worked for 11 years to complete this 6 by 10-ft bore. One hundred men could do it now in a few months and under living conditions far better than those enjoyed by the Emperor Claudius himself. In the state of Colorado, only a few years ago, less than 100 hard-rock men using modern tools and equipment and working at only one heading drove an equivalent portion of the six-mile, 10 by 11 ft Carlton drainage tunnel at Cripple Creek in 361 days.

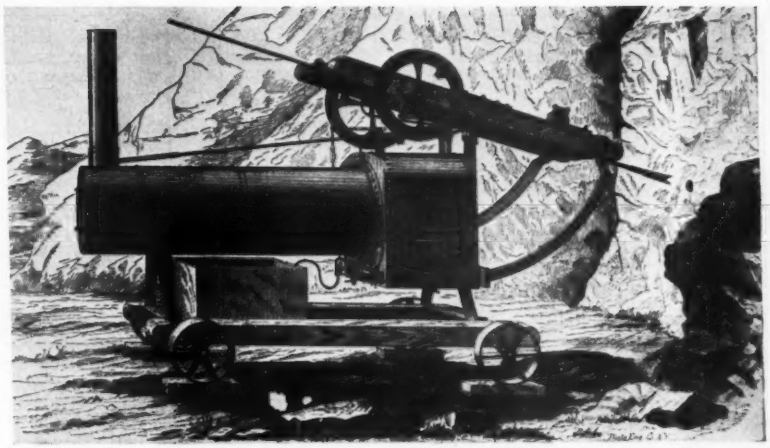
A recent report rated the rock drill number one in importance among labor-saving machines. Since all industry and manufacturing start with the removal of metals from the earth, their cost would be prohibitive if we

* Presented at the observance of the seventy-fifth anniversary of the Colorado School of Mines, September 30, 1949.

were still drilling by hand and, consequently, our supply of other types of labor-saving machinery would be extremely limited. The report also stated that the earning power of rock drills has trebled during the past 30 years; that drills have made the mining operation almost 100 percent mechanical and therefore more appealing as a job, and have made an inexperienced drill operator of today the equal of an old-time trained miner. Yet a 30-year record by one of our largest mining companies shows that its entire expenditure for rock drills and parts amounted to less than 2½ percent of the total cost of supplies and equipment.

What other type of equipment can match this?

The modern rock drill is a product of the patient and persevering efforts of many men. The plain truth is that the first drills were cumbersome, costly, and undependable. This is shown by the fact that, even with their help, 18 years (1855-73) were required to drive the nation's first major tunnel, the Hoosac railroad bore in Massachusetts. Even then, it was said that only the treasury of the state made it possible to complete the work. Had the mechanical engineer neglected the study of rockdrilling economics and thereby failed to improve upon the crude drills, it is doubtful whether further attempts at hard-rock tunneling or the development of low grade ores would have been made. Our so-called precious metals would then indeed have become precious. The wealth of the world, specially its gold, silver, copper, lead, and zinc, would have been drastically curtailed. What a different world we would have today without such mining districts as Homestake, South Africa, Bingham Canyon, Butte, the Coeur d'Alenes, as well as numerous low-grade properties. Or, for that matter, what might have been the outcome of the recent world conflict without the mechanical and raw-material wealth of Uncle Sam, all so closely dependent upon the rock drill?



The first mechanical rock drill was mounted on top of the boiler that supplied the steam for driving it. Patented by J. J. Couch on March 27, 1849, it was provided with means for catapulting the steel against the rock face and then retracting it. There is no record that it was ever applied commercially

The growth of mining engineering is closely related to progress in the art of building an efficient rock drill. Much of the early development of modern rock drills took place in Colorado mining districts and practical rock drills and the Colorado School of Mines came into being at about the same time.

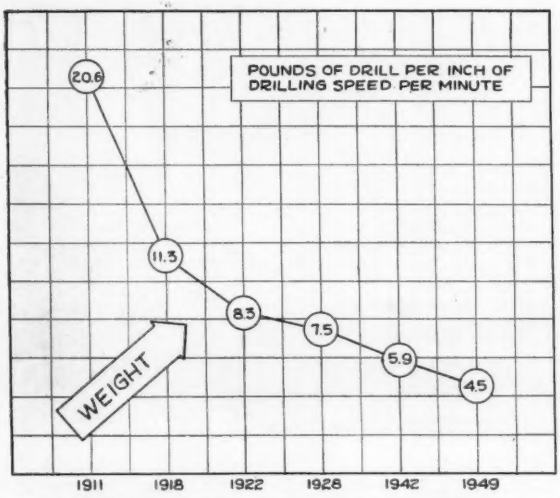
W. L. Saunders wrote in 1889: "The rock drill embodies more inventions for its volume and weight than any other machine of equal importance." The statement is even more true today than it was when he made it 60 years ago. Custom has been a strong influence to overcome in the development and introduction of rock drills and rock-drilling methods. There is probably no breed of men so loyal and devoted to old customs as the "hard-rock miner."

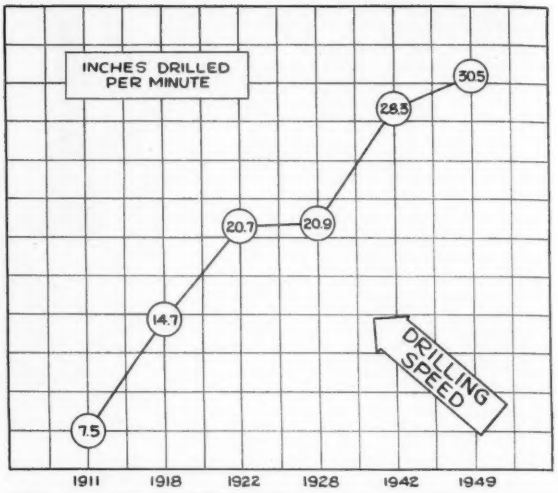
There is no complete consecutive history of the rock drill available for reference. The literature consists principally of fragmentary sketches describing different styles of construction and numerous articles written by inventors or those personally interested in the art. For this reason, the most accurate and unbiased record of the development of rock-drilling equipment is to be found in the patent literature. Most of the material that follows is based on that source of information.

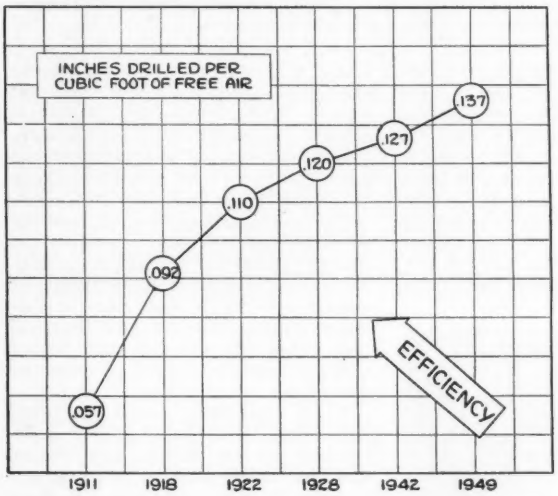
Drilling an "upper" with double-jacks and hand-held steel

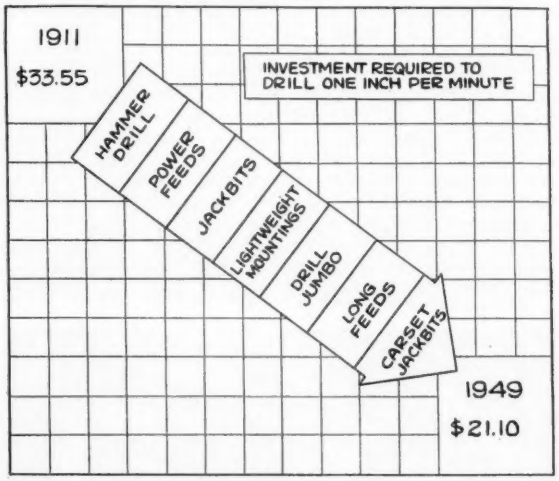
Rock Drill Specifications

The mechanical rock drill is strictly an American conception. We can find no outstanding designs or improvements that originated in any other









country, and drills made elsewhere, even now, are largely copies of American machines. Apparently this is another instance where Yankee ingenuity triumphed. Certainly there was a need for this type of equipment in the Old World long before any industry of consequence had been established here. That the Europeans were aware of this and were seeking the answer is borne out by the fact that they knew most of the qualifications of a good drill long before the inventive minds were able to produce one.

We refer to the following specifications for a rock drill set down by André, a Frenchman, in his admirable work on coal mining published in 1830:

(1) It should be simple in construction and strong in every part.

(2) It should have few parts, especially moving parts, and all parts should be easily renewable.

(3) It should be as light in weight as it can be made and still possess the required strength.

(4) It should occupy little space.

(5) The striking part should be of relatively great weight, and it should strike the rock directly. (Piston drills were based on this principle, but in the hammer drill the piston is relatively light and depends upon velocity to obtain the required force. Furthermore, in the hammer drill the piston and drill steel have been separated, and the punching action in the piston drill has been supplanted by a hammering effect.)

(6) No other part than the piston should be exposed to violent shocks.

(7) The piston should be capable of working with a variable length of stroke.

(8) The sudden removal of resistance should not be liable to cause damage to any part.

(9) The rotating motion of the drill steel should take place automatically.

(10) The feed, if automatic, should be regulated by the advance of the piston as cutting advances.

(11) The machine should be capable of working with a moderate degree of pressure.

(12) It should be capable of being readily taken to pieces.

It is truly amazing how thoroughly acquainted with the subject and how farsighted André was. Those who are familiar with modern rock drills will recognize that his specifications have been more than fully met, for the application of the hammer principle makes a far more effective and quicker-acting tool than it was possible to visualize when he was preparing his book more than 100 years ago.

The natural and most effective way to drill a hole in rock is to strike a steel chisel or drill bit with a hammer. The early miners used this method, and the first rock-drill designers sought to duplicate it. In their early mechanical developments, they were forced to retreat to a construction where the entire drilling element was tied to the piston and reciprocated back and forth with it. It took nearly 50 years to devise a method for divorcing the two elements and work

back to the original hammer principle used in hand drilling.

Another premechanical-era method of drilling was to lift a heavy pointed bar of steel by hand and allow it to drop by gravity. In an effort to simulate this method during the digging of the Illinois-Michigan Canal in 1838, Isaac M. Singer and his brother built a number of rock drills in which the drill bar was lifted with a steam piston, but the dropping or working stroke was by gravity. This drill was, by necessity, limited to vertical drilling. It is of interest to note that Isaac Singer later acquired fame by inventing the sewing machine, but there is no record that he ever again attempted to make a rock drill.

Early Drills Were Cumbersome

In 1849, J. J. Couch, of Philadelphia, was granted a patent on a percussion drill actuated by steam and mounted on a frame atop a boiler carried on a four-wheeled carriage. A wheel, rotating through the medium of a ratchet, built up the momentum by which the drill bar was hurled, lance like, at the rock face. It was the first drilling mechanism with an automatic valve, the first that did not depend solely upon gravity for the drilling stroke and, therefore, the first one that could be applied to other than vertical drilling. It weighed several thousand pounds.

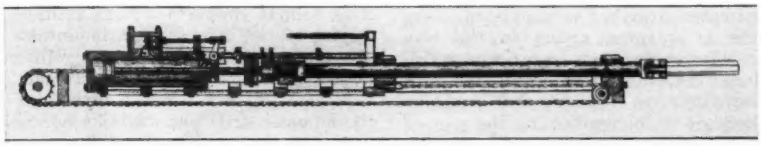
Couch's cumbersome machine was followed by a percussion-type rock drill, built under U. S. Patent No. 7972, granted to his assistant, J. W. Fowle, in 1851. Fowle's original idea of the cutting tool as an extension of the piston rod continued to hold supremacy in many improved and simplified forms up to comparatively recent times. Fowle also achieved rotation through a ratchet-and-pawl mechanism.

Likewise, in 1851, Cavé obtained a patent in France on a drill designed to be operated by either steam or compressed air. The drill bar was clamped directly to the pistol rod, but the valve action and rotation were controlled by hand and were consequently uncertain and slow. Although this drill was not a commercial success, it was the first one on record designed for operation by compressed air. The first recorded successful transmission of compressed air for operating a rock drill was in 1861 at the Mont Cenis Tunnel in the Alps.

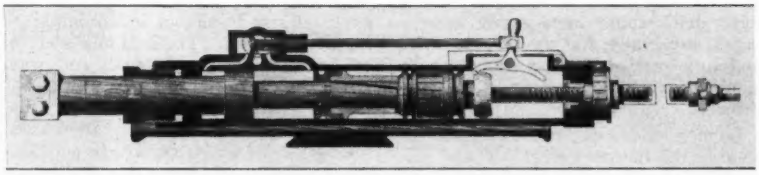
In 1853, William Pidding invented a steam drill, and in 1855, Mr. Fontain Moreau patented an air-operated drill. Neither of these models apparently provided any features worth recording.

When in 1855, after much unfruitful planning, driving of the Hoosac Tunnel was finally begun, the rock was found to be too hard and operating conditions too difficult for economical drilling with the then prevailing hand methods.

In an effort to solve the problem, Charles Burleigh, John W. Brooks and Stephen F. Gates built a mechanical drill and obtained a U. S. patent on it in 1866, and Burleigh secured several other patents on rock-drilling equipment in the same year. Some 40 of these drills, representing a modification of the Couch and Fowle patents, were constructed and used in the tunnel, which, therefore, became the first American bore to be driven with mechanical drills. Burleigh redesigned the drill in 1868, organized the Burleigh Rock Drill Co., and bought the Fowle patent, which his machine infringed. Thus, his concern became the first successful rock-drill manufacturing company. With the new drills, the tunnel was finished in 1873.



The first Fowle drill was designed to automatically rotate the drill steel, which was clamped to the piston. It was the first machine that possessed all the essential features of a practical rock-drilling machine



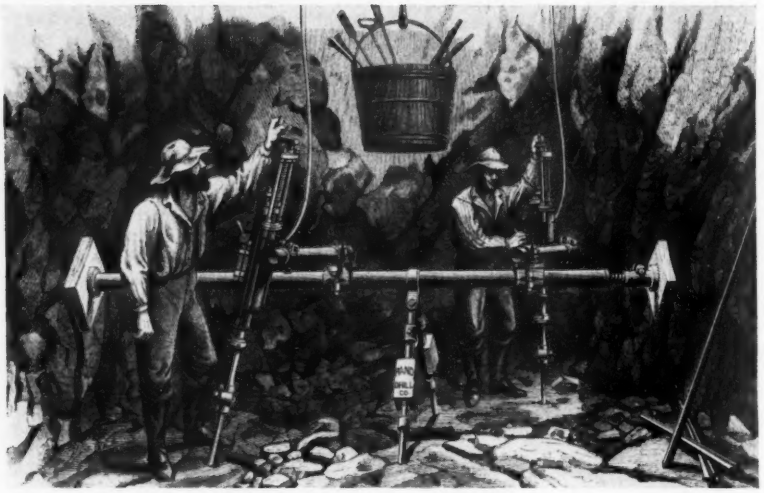
The first Burleigh drills were used in the Hoosac Tunnel; but it is recorded that the expense for repairs was enormous. In 1868 Burleigh redesigned it, and the tunnel was finished in 1873 with the improved machines

It should also be noted incidentally that nitroglycerin, which had been patented in the United States in 1867 by its discoverer, Alfred Nobel, had its first application for rock excavation in that same tunnel. Also, the air compressor that Burleigh built in 1866 to operate his drills was the first large one of practical value to originate in the United States.

The construction of the Burleigh drill remained fundamentally unchanged up to 1871. In the meantime, a considerable number of them were built. In fact, "Burleigh" came to be the popular name for a piston drill among hard-rock men and persisted for many years after that drill was out of production.

In 1871, Simon Ingersoll obtained patents on a rock drill and a universal tripod mounting. His drill was based on the Fowle-Burleigh construction and incorporated the better features of those machines. The tripod support, held steady by leg weights, was the first convenient rig for drilling holes at any angle from vertical to horizontal and was widely used for 40 years thereafter. The Ingersoll Rock Drill Co. was formed in New York to put these inventions on the market, but as the earlier patents stood in the way, the Burleigh Rock Drill Co. was purchased and the drill redesigned as the "Ingersoll Eclipse," which some rock-drill men still remember.

The man primarily responsible for its improvement was Henry C. Sergeant, whose name will have a permanent place in the history of the art. Simon Ingersoll had some part in the developments, but his official connection with the company terminated after a few years. Fowle and Burleigh likewise forsook the rock-drill field for other endeavors. Sergeant entered the picture as a partner in the machinists' firm of Sergeant & Cullingworth Co., to which the Ingersoll concern took some of its development problems. Sergeant designed the Eclipse valve, which largely overcame the troubles that had been experienced with the cam or tappet-valve motion in the earlier drills. The Eclipse was an unbalanced spool valve, positively pressure thrown by the steam or air used to operate the drill and had no mechanical connection with the piston. Sergeant continued to contribute ideas for improving the Ingersoll drill until 1883, when he came out to Colorado to engage in silver mining. While there, he conceived the idea of another valve action in which a segment of a ring in contact with the drill piston acted as a trigger for moving the main valve. He returned to the East in 1884, and organized the Sergeant Drill Co. to exploit his invention, which was embodied in what came to be known as the Sergeant auxiliary-valve drill. In 1886, the Ingersoll and



Rand drills sinking a shaft in 1880

Sergeant firms were merged to form the Ingersoll-Sergeant Drill Co., which continued to manufacture the Eclipse and Sergeant drills under Sergeant's personal supervision.

Two years after Ingersoll launched his business, the Rand Brothers, A. C. and J. R., formed the Rand Drill Co. and began manufacturing at Tarrytown, N. Y., a tappet-valve machine that was likewise an improvement on the Fowle-Burleigh construction. Strangely enough, the Ingersoll and Rand interests, which were later to combine, did not immediately come into very much direct competition, the reason being that the former devoted most of its efforts to the contracting and tunneling field, while the latter concentrated on the mining industry.

New Industry Grows

By 1874, or 75 years ago, the infant rock-drill industry was getting a good start. Its products were in considerable demand, as they almost immediately proved themselves to be time- and money-savers. One of the first big jobs they performed was the driving of the New Croton Aqueduct tunnels for New York's water supply, on which 400 machines were employed. The ensuing two decades were devoted principally to improving on existing models, and many inventors contributed to the refinements. Meanwhile the Sullivan Machinery Co. had been organized to manufacture a drill based on Albert Ball's patents. In this same general period, the McKiernan Drill Co., predecessor of the present McKiernan-Terry Co., began making drills after the patent of Warren Wood. Several other firms also entered the field, but remained in business only a short time.

As the turn of the century approached, the focus of rock-drill design and development shifted from the East to Colorado, and this brings us to the introduction of the hammer drill by John George Leyner, who unquestionably contributed more than any other individual to the basic design of the modern rock drill. It should be remembered that, with the drill steel attached to the piston, there was a pumping action in the hole which served, when water was introduced externally, to expel the cuttings or form a sludge that could be swabbed or blown out by the use of a blow pipe. Holes pointed below the horizontal were drilled wet and upward-sloping ones were drilled dry, the cuttings falling out by gravity. It had long been recognized that a light drill would have many advantages, especially for up-hole drilling, and this has led various designers to experiment with hammer-type machines.

Leyner, then, did not conceive the idea of the hammer drill. There are unsupported reports that this construction was proposed as early as 1865 and the record shows that Sergeant in 1884 patented such a drill, which was unsuccessful because it used solid steel and did not clear the hole of cuttings. The first acceptable hammer drill was patented and introduced in mining by another Colorado man, C. H. Shaw, of Denver. Being designed for overhead work, it was first employed in the stopes of Colorado mines and consequently acquired the name of "stoper." Since it represented a distinct improvement over existing models, the drill was, for a time, in great demand. Unfortunately, however, because hollow drill steel was not yet available, it was used dry and its dust-making characteristics earned it the name of "widow-maker."

As an indication that these old-time rock-drill men had an uncanny way of anticipating most of our so-called modern innovations, we note here that Shaw equipped his drill with a pneumatic feed leg that held it up to the drilling face, so he can be credited with two important contributions to current rock drill design. Apparently he didn't realize the true value of his air feed, for he neglected to protect it with a patent. Accordingly, other manufacturers adopted it, including several pneumatic tool builders of the day that chose this opportune time to get into the rock drill field.

Associated with Shaw was D. S. Waugh, of Denver, who was to improve upon and patent special features of the former's stoping drills. The manufacture of these tools was begun in 1890 by the Denver Rock Drill Manufacturing Co., which later combined with the Gardner Governor Co. to become the present Gardner-Denver Co.

Hollow Drill Steel Conceived

To Leyner, however, goes the credit for first successfully applying the hammer principle to drills for horizontal and down-hole work. The secret of his success was, of course, the idea of passing air and water through hollow drill steel to clean the hole. This sounds simple now, but actually Leyner faced almost insurmountable obstacles because no way of rolling hollow steel was then known. In fact, for some years this vital adjunct of the hammer drill was made by boring bar steel in the same way that rifle barrels are pierced. Leyner's first "steels" were pieces of hollow stay-bolt iron with bits and shanks welded on their ends. An example of his early efforts is shown in accompanying illustrations. The iron mid-section of Leyner's composite drill rod was naturally inferior to steel. Besides, it can readily be realized that the hole weakened the piece and increased the likelihood of its failure in service. As a matter of fact, the drill-steel problem is still a source of one of the industry's major headaches. As the hitting power of drills is continually increased, the difficulties of finding a steel that will withstand the hammering effect and the rotational strain grow ever greater. Even the recent development of austenitic cored alloy steel leaves us still seeking something better.

"Water Leyner" Born

By 1897, Leyner had developed his drill sufficiently to put it on the market. These first machines were, however, designed to clean the hole of cuttings with a blast of air alone. He sold 75 of them to mines, but the miners objected to running them because of the dust. Thereupon, Leyner took them all back, although it nearly bankrupted him, and set to work to overcome the dust problem. He ac-

complished this by passing both air and water through the steel. When the modified drills were returned to the mines, they soon showed their superiority over other types. The term "water Leyner" that was applied to them still persists in some sections to this day. Leyner obtained a patent on his principle, which has often been called the greatest single feature ever contributed to the advancement of rock-drill design.

As nearly as can be determined, Leyner first experimented with hollow steel between 1894 and 1898 in the Newhouse Tunnel which was then being driven as a development entry and haulageway for various mines between Idaho Springs and Central City. This bore, which was later renamed the Argo Tunnel, has been used as a field laboratory in mine surveying by Colorado mines for many years. Many graduates, looking back, will remember that they, like Leyner, faced perplexing problems in its dank interior.

In addition to the all-important hammering principle and the use of hollow drill steel, Leyner's drill introduced such improvements as automatic rifle-bar rotation of the drill-steel chuck, automatic lubrication, and inclosed throttle control. His inventions increased the speed of drilling action from 300 or 400 blows a minute to as many as 1600 or 1800, and made it possible for the first time to produce a machine light enough for one man to handle.

The Automatic Feed

Following the expiration in 1914 of the Leyner patents, which had been purchased by Ingersoll-Rand Co. in 1912, all the manufacturers started to produce machines of the hammer type and to utilize the water Leyner principle. During the intervening 35 years, many improvements have been developed. Of these, probably the most outstanding and the best example of competitive struggles is the automatic feed.

Although André in his 1830 specifications stated that the feed, if automatic, should be regulated by the advance of the piston as the cutting advances, it was not until the late 1920's that the Gilman air-feed drifter, although it was not automatic, started the race for an acceptable automatic feed. There have been many combinations of air-piston feeds, but none were controllable to the extent of being popular for general rock-drilling conditions in horizontal or drifting service.

In 1930, after years of laboratory and field trials, William A. Smith patented and assigned to Ingersoll-Rand a feeding device for percussive motors. One object of the invention was to utilize the force of the reciprocatory hammer piston to actuate the drill along its support. This was followed, in 1934, by a patent issued to Pearson and Carpenter and assigned to Gardner-Denver for a feeding mechanism; and then, in turn, by others to Curtis, assigned to the Cleveland Rock Drill Co.; and to Schorle, assigned to Worthington Pump & Machinery Corp., this last one in 1938. A similar list could be given of recent valve developments by the various manufacturing concerns, leading to an almost universal adoption of the double-kicker port valve or some variation of its principles.

Hand and machine drilling showing a power drill being used for the first time in a caisson under air pressure. The excavation was being made in the bed of the Harlem River, N. Y., for a pier of the Washington Bridge

The automatic feeds, steel centralizers, sliding cones, automatic air and water backheads complying with the most recent states' regulations on dust control, the drill carriage or jumbo, and now the latest type aluminum feeds, have made the rock drill so nearly automatic that, as has already been said, it makes an inexperienced miner equal to an old experienced hard rocker. Furthermore, with recent developments in air-motor-manipulated multiple drill mountings, the smallest miner can easily handle the heaviest rock drill, and in a shorter time than it was previously done. In fact, the driller's job has now become as simple and easy to learn as driving a truck.

Design and Material Problems

Throughout the development of the modern rock drill, the designer has collaborated with the metallurgist, for with each improvement in drill performance the moving parts have been subjected to more and more severe service and have demanded more resistant materials of construction. Equally important has been the constant demand to make the drills more powerful without increasing their weight.

It is a problem to find materials that will meet these requirements. To understand the seriousness of this continually recurring assignment, we have only to recall that a rock drill is virtually an engine of self destruction.

All of its parts must stand severe service conditions of some type, but the piston, by all odds, has to endure the greatest punishment. Metallurgists tell us there is no tougher service known for steel than it undergoes. During every minute of operation there are approximately 2000 violent collisions between the piston and the shank end of the drill steel. Both members are composed of tool steel, yet with steel striking steel with a cumulative impact of something like 40,000 ft-lb every 60 seconds, the piston is expected to stand up day after day. The drill steel is, of course, changed frequently, and damaged shanks can be easily and inexpensively repaired. The piston, however, must remain in the drill, repeating its tremendous hammering action, hour after hour.

Pistons are fashioned from the highest grade of steel obtainable. It is manufactured to rigid specifications prepared by the drill manufacturers, and so far only a few mills have been able consistently to produce material of an acceptable quality. Each heat is subjected to every recognized test at the command of the metallurgist. It is not enough that the chemical composition be

right. The various elements must be properly distributed throughout the structure to give it uniformity, good grain structure, smoothness of surface, freedom from inclusions, and suitable hardening characteristics. From the time a heat of steel is poured until it is manufactured into pistons, it undergoes approximately 1000 individual tests.

After the metallurgist has found acceptable material and has seen to it that each lot is up to standard, the job is only begun. The piston is then built with a watchmaker's precision. It must be machined to within .0005 in. of its specified diameter. Without going into details regarding the manufacturing procedure, we can indicate what it entails by stating that 48 separate operations are required to complete a piston. It is small wonder, therefore, that metallurgists have hunted far and wide for a piston steel preeminent quality, or that they respect so highly the service for which it is designed.

Special Equipment Aids Design

The availability of scientific laboratory equipment gives today's drill designer a distinct advantage over his predecessors. Exactly what happens inside a rock drill was, until recent years, purely a matter for conjecture. With the advent of high-speed stroboscopes and cameras and cathode-ray oscillographs, we are now able to look into the valve chest and cylinder, view the rotation and anvil block, and stop these rapidly moving parts to study their functions under variable working pressures.

Rock-drill designers long ago recognized the need of determining the relations between cylinder pressure and piston positions—to ascertain operating conditions as a basis of seeing what could be done to improve them. However, they had no means of learning these things. It is indeed remarkable that they made so much progress with so little fundamental engineering knowledge. The development of the rock drill, up to very recent years, was truly a triumph for Yankee mechanical intuition and ingenuity.

As far as we can determine, the first pressure-volume indicator cards for a pneumatic rock drill resulted from work that was begun by W. A. Morrison in 1934. An accompanying illustration shows one of his cards for a 3½-in. drifter drill. To those who are familiar with engine or compressor pressure-volume diagrams, this one will appear peculiar indeed. However, when we consider the nature of the action that takes place in a rock-drill cylinder, we can better understand its unorthodox nature.

With these modern laboratory aids increasing our knowledge of the problems that confront us, we can state with assurance that the rock-drill industry will move forward on a more scientific basis of designing and developing machines of continually improving effectiveness.

Ever since the pneumatic drill was introduced, it has predominated in every type of rock-excavation work except that of putting down deep, large-diameter blast holes in crushed-stone quarries, open-pit mines, and coal-stripping operations. Now, as a result of a recent development that merits mention here, its service is being extended to those fields.

Shortly before the last war began, and again after we had entered it, our Government issued urgent requests for a larger and better submarine drill than was then available in order to speed up the Panama Canal construction and maintenance program. The industry had gone the limit with steam drills of the type that had been generally accepted up to that time. Our engineers felt that further improvement rested on the possibilities of designing an air-operated machine for this service.

The problem involved in producing a successful air drill of the size and characteristics required was to make it efficient enough to permit holding the necessary air-compressor plant within allowable size limits. The operating principles of an air drill are altogether different from those of a steam drill, where both ends of the cylinder are alternately charged with live steam and emptied to atmosphere during each cycle. Conversion of the old steam drill to air operation would have required a prohibitive volume of air for a machine of the size needed, even though it could have been made to work.

With the knowledge they had by that time acquired concerning valve performance and the actions taking place within the cylinder of a rock drill, Morrison and Bennett developed a machine that met the requirements of the Canal authorities. It was patented in July 1941, and assigned to Ingersoll-Rand Co. When the construction of the third set of Panama Canal locks was discontinued, a number of these large drills were in service.

After the war was over, the same principles were applied to a dry-land drill to fill the long-existing need of a better drill for quarrying and open-pit operations. The industries concerned, supported by the U. S. Bureau of Mines, had requested a machine that would drill faster, have better feed control, automatically controlled rotation to produce a chipping or cutting action rather than the crushing effect of existing churn drills and, most important of all, include means of cleaning the hole continuously and automatically.

These features were all incorporated in the air-operated Quarrymaster Drill, introduced in 1947. Consisting of an air plant, tower, and all accessories on a power-propelled, crawler-mounted chassis, it employs a piston-type drill that strikes 200 blows per minute and is capable of drilling 6-in. diam holes up to 100 ft deep in the hardest types of rock.

Detachable Bits

No article on rock drills would be complete without calling attention to the development of the detachable rock-drill bit. Although we think of this accessory as a recent development, it is interesting to learn from the log of our patent recordings that William Buckley of Pottsville, Pa., was issued a patent on February 3, 1875, for a detachable drill bit having a threaded attachment, and even more astounding is the fact that it was designed to use hard inserts set into dovetail grooves in the steel-bit head. Also, Andrew Nichol of Scranton, Pa., was issued a patent in November 1878, for an improvement in hand drilling, which consisted of a tubular steel socket with a screwed thread cut in its interior diameter into which a threaded detachable bit was inserted. It is recorded, too, that both Sergeant and Leyner devoted considerable time to a detachable bit, the latter having been granted a patent in November 1905, for a tapered-joint press-on type of bit. However, it remained for Arthur L. Hawkesworth of Butte, Mont., to patent on March 4, 1919, the first detachable rock-drill bit to be used on an extensive scale. It was retained on the drill rod by a dovetail slot and was generally adapted in the Butte mines of the Anaconda Copper Mining Co.

In April 1925, Fred W. Thurston was granted a patent on and started production and sales of a detachable bit secured to the drill rod by means of a threaded sleeve connection.

In 1933, The Timken Roller Bearing Co., seeking a new market for its excess steel production, introduced a detachable multiple-use, rock-drill bit, and was followed soon afterward by other major manufacturers that had been experimenting in this field since the introduction of the Hawkesworth bit.

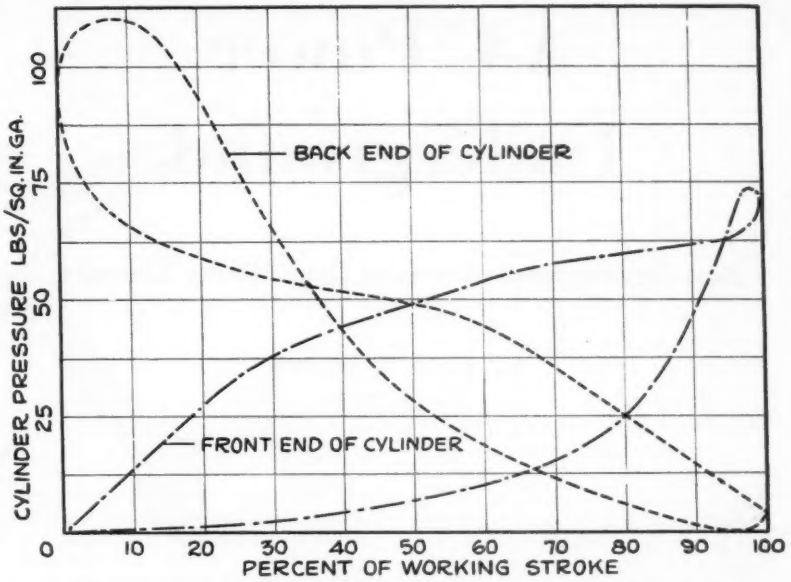
It required about ten years for the domestic rock-drilling industry to convert from fitted steel to approximately 90 percent usage of multiple-use steel bits. During the same period various designs of steel bits classified as "one-pass" or "single-usage" were introduced widely in Canada and South Africa. In the main these bits are distinguished by a simple type of attachment to the drill steel, usually a friction-taper fit. They are discarded following the first usage and are low in initial cost. They were introduced

in American drilling practice about two years ago.

Tungsten-Carbide Bits

During the early thirties when detachable steel bits were making their universal debut, the spectre of a radically new development, portended by Buckley's 1875 patent, made its appearance on the drilling horizon in Germany. This was the use of tungsten-carbide tips inserted in the cutting edges of rock-drill bits. The possibilities of a non-dulling medium on the end of a drill rod to contact the rock had long been dreamed of by drill designers and rock-drill operators. Usage of the bit spread from Germany to Scandinavia and other European countries. The friability of the available tungsten carbide and the limited technique of mounting the inserts in steel bodies restricted the European use of tungsten-carbide bits to light rock drills and relatively low air pressures.

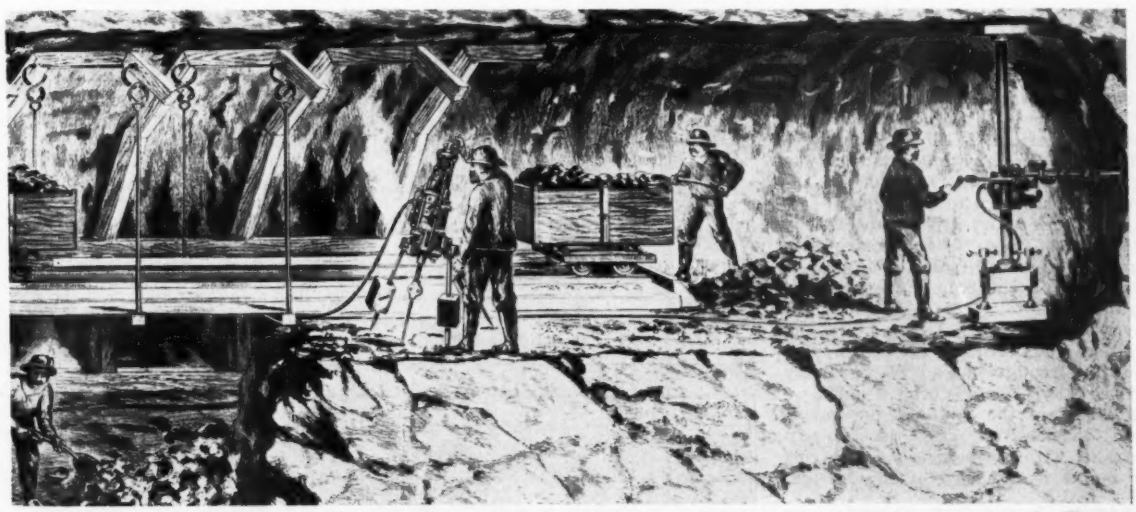
As World War II drew to a close, Ingersoll-Rand Co. renewed a research program which it had been forced to discontinue during the war years, and collaborated with the Carboloy Company in the development of a tungsten-carbide insert bit suitable for general use with American design rock drills operating with the prevalent air pressures. Its commercial introduction has sparked a competitive race to provide the industry with the greatest potential cost-cutting tool since J. George Leyner introduced hollow steel struck independently by the piston of the rock drill. Management has been quick to capitalize on the potential savings resulting from increased drilling speed, lower dynamite and compressed-air consumption, reduced rock-drill maintenance, and increased productivity per man-shift. The more resistant the rock to drilling, the greater are the potential savings with tungsten-carbide insert bits. However, the subject of rock-cutting media is so controversial and so current that it would not be appropriate to cover it further in an historical treatment of rock drilling at this time.



Pressure-volume diagram of drifter. This was taken on a 3½-in bore drifter operated with 90 psi air pressure

After looking backward, as we have done here, we can conclude that rock-drill designers and manufacturers have done and are still doing a creditable job. This claim was recently illustrated in a Minnesota iron mine. Using long steel changes on automatically fed drifters mounted on multiple-drill jumbos, and employing tungsten-carbide bits, they drove a development tunnel at a savings of 65 percent in man-hours, or $92 per foot of advance. The comparison was made with similar work done previously with equipment that is still so new that it is utilized in neighboring mines.

Many similar examples could be cited where the "pay-off" time of drilling equipment has been reduced to just a few eight-hour shifts. Cost-performance figures show how the modern drill is reducing the expense of breaking rock and ore and at the same time rendering the miner's job better paying and more appealing.



Section through a 7250-ft tunnel driven at Niagara Falls in 1890 in connection with a hydroelectric-power project. Note arrangement that permitted advancing top heading and bench at same time and the use of a tripod-mounted drill at the bench

A-C Power Underground*

New Developments Increase Coal Mining Efficiency

By JOHN L. PETTY
Electrical Inspector
West Virginia Department of Mines

BELT haulage in coal mines has increased greatly in the past few years. The production from these mines now forms a considerable part of the total coal production and is growing constantly. Many of these operations are utilizing a-c power, and its advantages in modern mining should be considered in plans for new operations and in any plans for converting from hand loading to mechanical loading.

The use of a-c power has met with some difficulties not ordinarily encountered when using d-c power. It is not uncommon to find line losses as high as 20-25 percent at d-c operations. Due to the inherent characteristic of the a-c motor such losses cannot be tolerated; therefore, a more efficient and flexible power distribution system must be used.

The need for such a system has brought about some changes in the design of the underground power distribution equipment. Descriptions of three installations will explain these changes and the need for them.

Portable Stations Reduce Line Loss

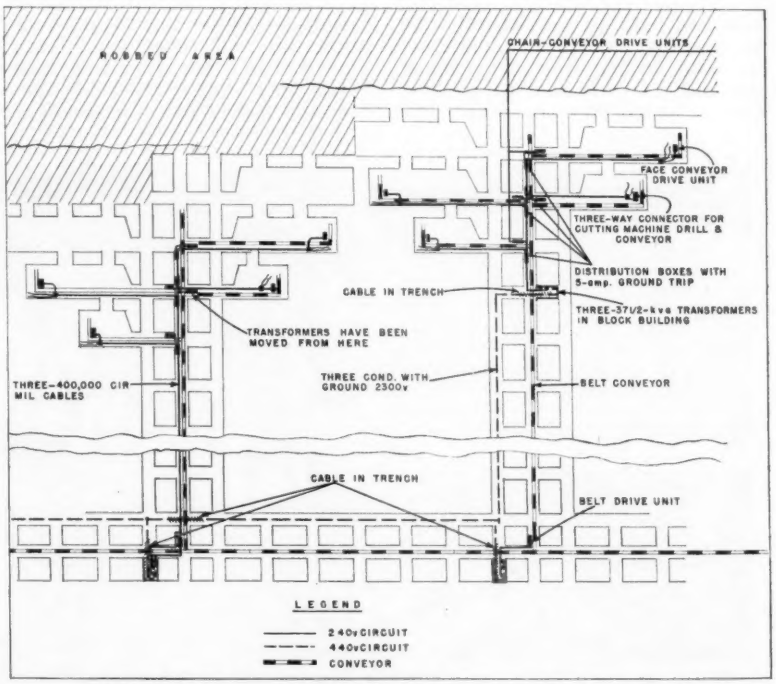
The first application is in a mine that has been operating since 1945. The thickness of the coal seam averages approximately 40 in. The workings at the present time extend underground approximately 15,000 ft, the cross entries turn to the right or left of the mains and are advanced to a distance of 2500 ft; rooms are then worked from both sides. The coal is hand loaded on chain conveyors then transported to the preparation plant by belt conveyors. To maintain the voltage required for efficient operation of a-c equipment, a 2300-v primary distribution system is used. The 2300-v cable enters the mine at the portal and extends through the airway parallel with the belt haulage entries to points near each working section. Taps are then taken off the cable through fused disconnects to the transformer stations where the voltage is stepped down to 230 v. The power is then transmitted to the face distribution center with three 400,000-cir mils cables 1000 ft long. It is then distributed to the various pieces of equipment through portable cables approximately 350 ft long protected with air circuit breakers equipped with ground-current trip relays. The transformer stations must be moved up each time the entries are advanced 1300 ft.

Transformer stations consist of three 37½-kva standard, oil-cooled transformers, an oil circuit breaker for the primary circuit and an air circuit breaker, equipped with a ground-current trip relay for the secondary circuit. To install these transformers underground, it is necessary to take either some top or bottom as the over-all height of the transformer is greater than the coal seam. A building of incombustible material must also be provided, with provisions made to confine the oil if the transformer case should leak or become ruptured.

Two of these stations are required for each set of cross entries. No. 1 station is installed near the entrance. When the entries have been advanced half their total distance, No. 2 station is installed. No. 1 station will then be used to supply power to the belt drive unit only until all the coal inby No. 2 station has been mined out.

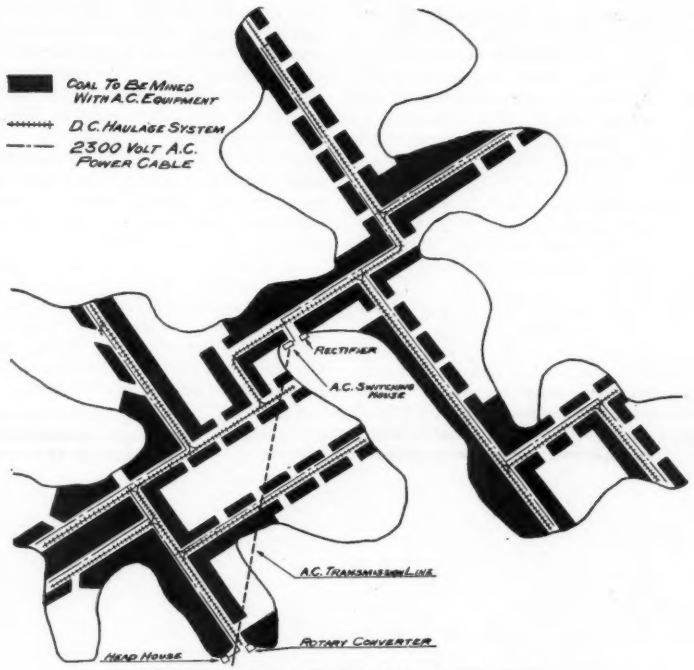
To move one of these stations from one location to another, the oil must be drained from the transformer case and the core or windings removed or braced in such a manner that they will not be damaged in handling. After the station has been dismantled, the parts are transported to the new location on the belt conveyor and reassembled.

To prevent these moves from interfering with the normal operation of the mine, a certain amount of this work must be done while the mine is idle. On several occasions, due to factors beyond the control of the management, more than one of these stations should have been moved at the same time. Without the required men to do the jobs, the transmission distance of the 230-v system had to be extended, causing the voltage drop to



Portable stations provide flexibility to the first application outlined

* Adapted from a paper presented at the November 1949 meeting of the West Virginia Coal Mining Institute.



Conveyors move bulk of coal from room pillars

be so great that the equipment did not operate efficiently.

Recently this company has installed some dry type transformers that have resulted in a savings of about 40 to 50 percent of the time required to move a station; but it is still necessary to do part of the work while the mine is idle, which is not a desirable feature due to the stations having to be moved so frequently.

A-C Power Simplifies Distribution

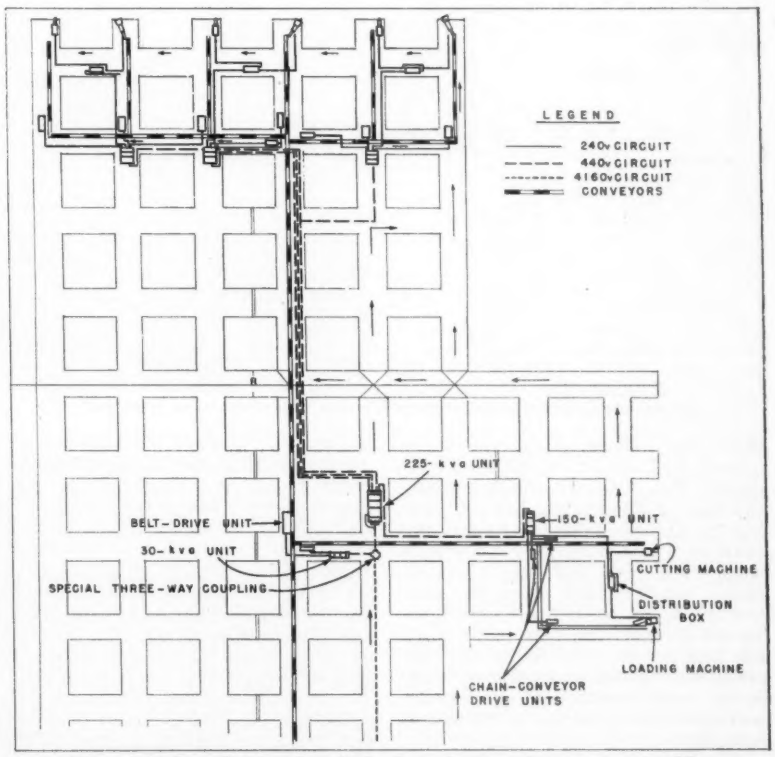
The second application of a-c power is in an old mine that was developed by hand loading into mine cars. This operation is in a seam of coal that is high up near the mountain top. The bulk of the coal is in several widely separated bodies connected by narrow strips. The main entries usually follow along under the main ridge of the mountain, while the cross entries turn at most any angle and follow along under the points that branch off from the main ridge. In developing this mine by hand loading into mine cars, most of the rooms were worked as the entries were advanced. Under these conditions, the number of pillars that could be worked in any one area was limited to a very few, causing the production in that area to be low. To increase this production, mechanical equipment was installed. This, in turn, required more power as the capacity of the original power system depended almost entirely upon the haulage power demand. To supply this additional power in direct current to the widely separated areas, it would have been necessary to install two conversion units. This would have been an expensive installation and the pillars may be extracted at such a rapid rate that the stations would have to be moved several times.

By using a-c powered face equipment and a high voltage transmission system with dry type or noninflammable liquid-cooled, stepdown units near each working section, the additional power was supplied to all the sections at a cost of 50-60 percent of the cost of one rectifier. At the same time, the problem of moving the stations was simplified to a point comparable to that of moving a conveyor drive unit, but, as in the case of the preceding application, it is necessary to do some of the work while the mine is idle.

New Developments Facilitate Station Moves

The third application of a-c power is in a new mine and, at the present time, is operating only four loading units. The power distribution system for this mine is different from other systems in several ways. At the present time it is not known how successful this system will be as it has not had a chance to prove itself.

This mine is operating in a seam of coal that averages approximately 40 in. in thickness. The lease contains 2800 acres. For the mains there is a set of six entries that will extend straight back in the coal bed to a distance of 12,000 ft. The cross entries



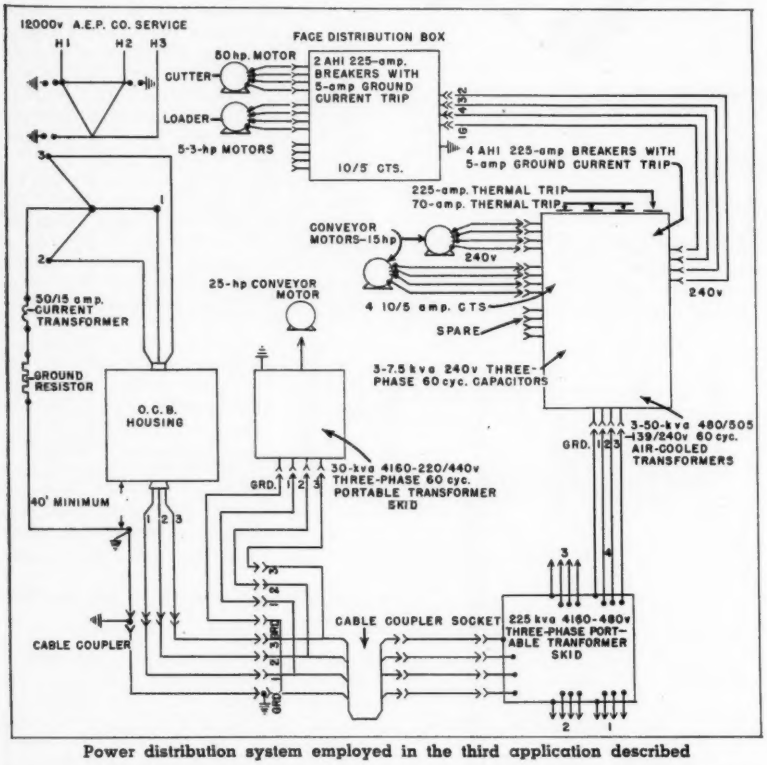
Plan of third application described where the use of a-c power simplifies station moves

will be turned both to the right and left of the mains in sets of four entries each. The right cross entries will extend to a distance of 3000 ft and the left to a distance of 3000-5000 ft. Rooms will then be worked from both sides. The coal is mechanically loaded on chain conveyors, then transported to the surface by belt conveyors.

To develop this mine, it is planned to centralize all the work in as small an area as possible. To accomplish this, one loading unit will be operated in each pair of entries on the mains, while in the cross entries there will be one loading unit operating in four entries. By the time this unit advances the cross entries to a point that it would be necessary to install a belt, the mains will have advanced far enough for the unit to move up and start a new set of cross entries.

shielded cable with built-in ground conductors at a pressure of 4160 v. The cable is suspended from the roof of one of the intake entries parallel with the belt haulage entry and extends underground to a central substation. This station consists of three 75-kva air-cooled transformers, a set of three mechanically-interlocked, fused-oil disconnect switches, and four air-circuit breakers, all built into one compact unit and mounted on skids. The over-all height of this unit is less than 30 in.

To obtain power for the belt drive motors at the proper voltage, a 30-kva unit similar to the one above is inserted in the 4160-v circuit by using a special three-way coupling. From the secondary side of the central station, through the four air-circuit breakers, the power will be transmitted at 480 v through 0000, three conductor, portable cables, sectionalized in 300-ft lengths to four unit or section stations. Each of these four stations consist of three 50-kva air-cooled transformers, four 7.5-kva capacitors, one air circuit breaker on the primary side and four air circuit breakers on the secondary side. All of these are built in one compact unit, 81 in. long, 39 in. wide and 20⅞ in. high. From the secondary of these stations through the air circuit breakers, the power will be distributed at 240 v, phase to phase and 139 v to ground, to two room-conveyor drive units and one face-distribution box through four-conductor portable cables. This leaves one spare circuit breaker for the rock-dusting machine or any other piece of equipment that may be needed.



Power distribution system employed in the third application described

With this system, it is possible to operate five units in an area approximately 800 ft square. By developing the mine in this manner and by limiting the distance from one unit to the other to a minimum, the efficiency of supervision, maintenance, ventilation, supply handling and power distribution can be increased at the same time. If the demand for coal justified it, the production could be greatly increased by installing additional units in the cross entries and mining the coal from both sides as the mains are advanced.

The power enters the mine at the portal through a three-conductor 0

The face-distribution box will be equipped with two circuit breakers and three plug-in outlets. Two of the outlets will be connected through the same circuit breaker. This was done so that two cutting machines can be connected, but only one will be operated at the same time.

In addition to the overload protection provided with the air circuit breakers, each piece of equipment will be protected with a ground trip relay which will remove the power from the circuit in case of a ground fault of five or more amperes.

To move the central station, a utility truck mounted on caterpillars is connected to the secondary side of the 30-kva unit provided for the belt drive motors. Then, with the high voltage cable disconnected from the station, it is pulled along the airway to the new location and reconnected by adding a new section of cable.

The unit stations will be moved each time the chain conveyor drive units are moved and very much in the same manner, except that the additional section of cable will be added before starting the move and the power will be on the station while moving.

The 480-v intermediate distribution system is used for the following reasons:

(1) By using a voltage below the high voltage range, the cables can be installed in the belt haulage entry where they can be inspected and maintained at the same time as the belt conveyor.

(2) The unit stations may be moved from one location to another without disconnecting them from the power circuit.

(3) It is not necessary to place the cable in trenches or conduit when crossing haulageways and travelways.

(4) If at any time the main h adings should run into a fault or some condition that production could not be maintained, some of the units could be moved into the cross entries and advance in any direction from the main station to a distance of 3000-4000 ft.

(5) The only time that it will be necessary to interrupt the main power is while moving the main station. By it being possible to advance 3000-4000 ft for each move, the work can be done at the most convenient time.

The cost of this installation amounted to approximately 60 percent of the cost of a d-c installation which would be required for this same mine, assuming that one portable rectifier would be used.

In the first of these three installa-

tions described, the difficulties encountered in moving the stations when using standard oil-filled transformers are readily noted as well as the need of a flexible power distribution system that will permit the stations to be moved without interfering with the normal operation of the mine.

The second installation was described to point out the adaptability and economy of using a-c powered face equipment and a d-c haulage system.

The third installation was described to point out the new developments that have been made in an effort to simplify the moving of the stations.

Advantages and Disadvantages

To sum up the advantages and disadvantages that apply to a-c power, we find:

(1) Higher efficiency from transformers than from converting units

(2) Lower cost of transformers compared with cost of converting equipment

(3) Thirty percent lower maintenance cost compared by the number of maintenance men employed at d-c operations to the number of men employed at a-c operations, with approximately the same amount and type of equipment at each mine

(4) Lower installation cost of a-c substations compared to d-c stations, especially in thin coal seams

(5) Higher efficiency and greater flexibility in a-c distribution system than in d-c, accomplished by using higher voltage for transmission and portable step down units near each working section

(6) Less power used to produce a ton of coal with a-c power than with d-c power, with the comparison made in the following manner:

With a group of five mines, each producing 11,200 to 12,700 tons per month, one using a-c power, it required 6.59 kwhr per ton at the a-c mine, while the average of the four d-c mines was 6.96 kwhr per ton. With a group of five mines, each producing 14,200 to 14,500 tons per month, one using a-c power, it required 4.08 kwhr per ton, while the average of the four d-c mines was 7.76 kwhr per ton. With a group of five mines, each producing 30,000 to 30,700 tons per month, one of them using a-c power, it required 5.90 kwhr per ton at the a-c mine, while the average of four d-c mines was 7.51 kwhr per ton.

Comparing the tons of coal produced per man day, using five a-c operations and five d-c operations, with an equal number of each operating in coal beds approximately the same thickness and an equal number hand loading or machine loading into conveyors, the average for the a-c mines was 6.45 tons per man day and for the d-c mines 5.08 tons per man day.

For the disadvantages:

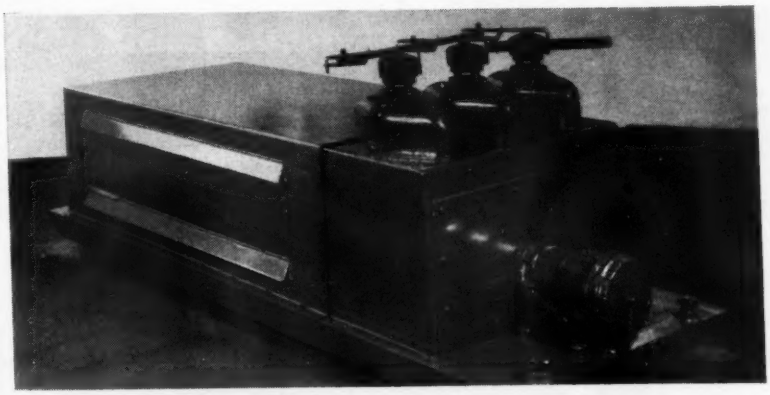
(1) The a-c motor, due to inherent characteristics, will not withstand the surge power abuses when compared to the d-c motor. This is especially true for mining machines and mobile unit motors. or for variable speed service.

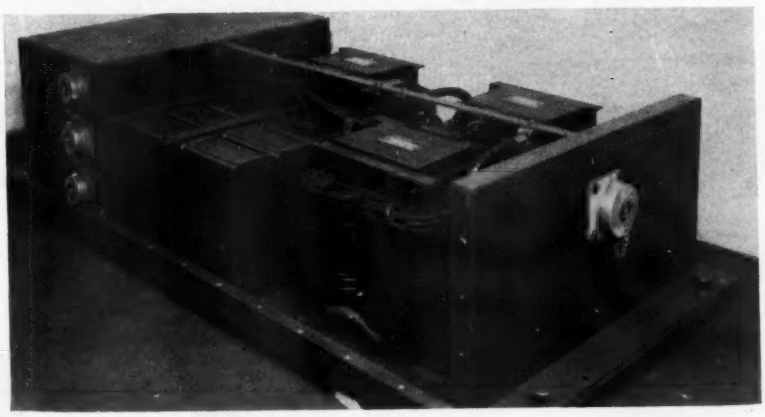
(2) The a-c motor is not suitable for mobile haulage purposes,

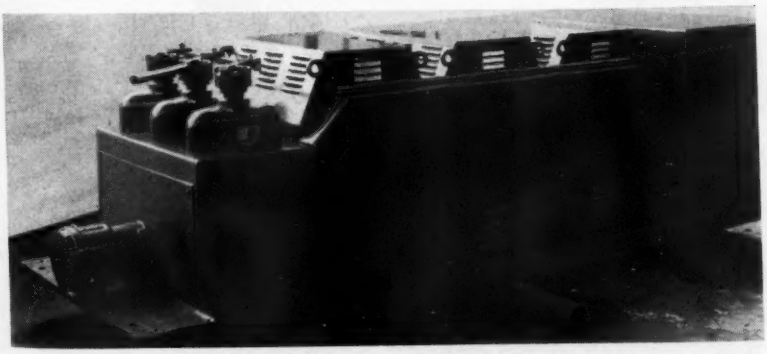
(3) Possibly higher cost for cables, due to increase in number of conductors required; although, with unity power factor and the voltage, distance, and current the same, the power can be transmitted in a-c with 75 percent of the copper required for d-c. However, as the power factor drops off, the size of the conductors increases rapidly.

(4) More expensive protective equipment for a-c than for d-c.

There are, of course, many different combinations that can be used to make power cost and production comparisons. From those given here, it may be assumed that the use of a-c power for coal mining purposes, especially when belt haulage is used, has advantages over d-c power.







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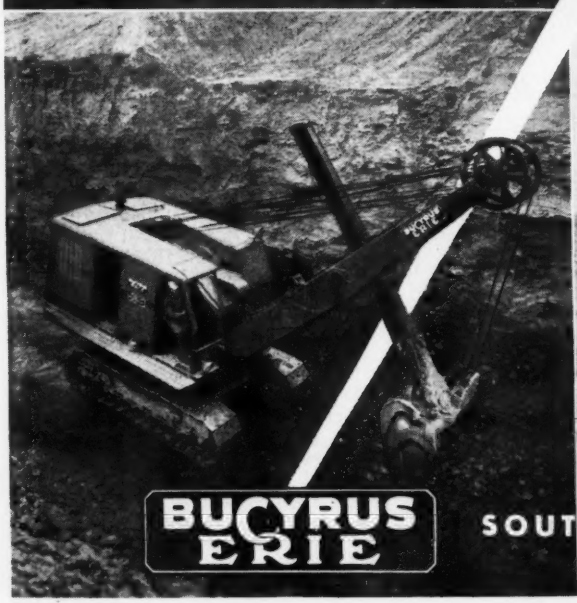

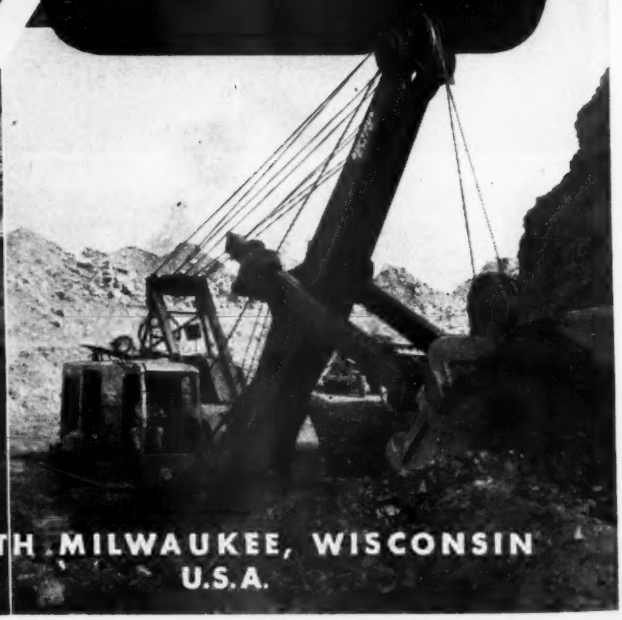

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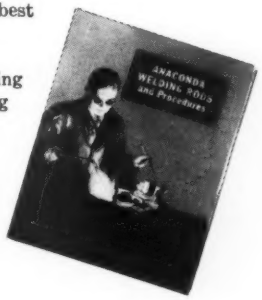

*Reg. U. S. Pat. Off.

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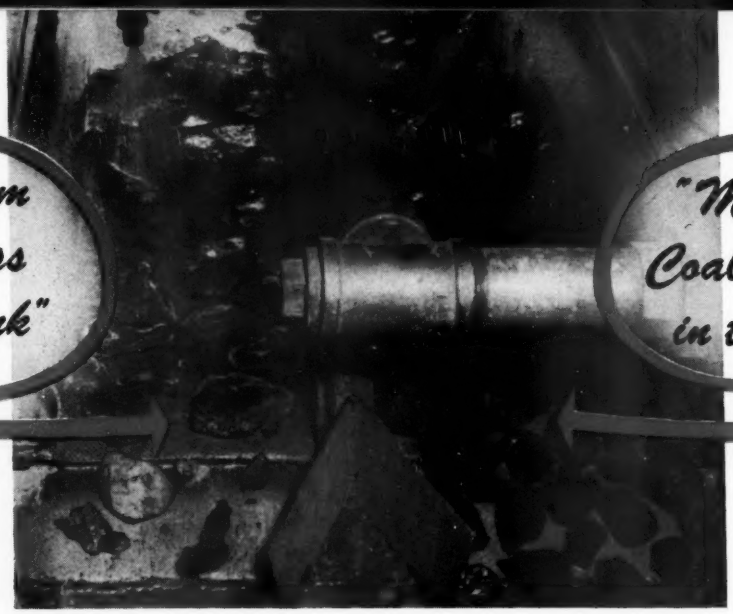

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You've mined it, hauled it, crushed it, screened it. Loaded in a hopper car, a ton of clean coal is worth up to $7.00. Dumped on the refuse bank, that coal is a net loss of your cost plus your profit!

Yet inefficient cleaning units can fail to recover two (or more) tons of saleable coal from every hundred tons washed, according to the published figures of a well-known coal preparation authority in a recent technical article comparing the performance of Heavy-Media Separation and earlier washery equipment.

How can you check the recovery performance of your cleaning equipment? *Before* you install any new cleaner, how can you be sure that you will get maximum recovery of shipping-grade coal?

By having an independent testing laboratory run "heavy liquid" tests on your feed coal and, if you now clean, on your refuse. By comparing what you can ship using ordinary washers with what you can ship if you use Heavy-Media Separation—the only cleaning process that closely duplicates "heavy liquid" results over a full size-range at any gravity from 1.25 to 2.00.

Remember, the difference in recovery between Heavy-Media Separation and inefficient cleaners for a total-seam mechanized operation can mean as much as $20,000 per year additional revenue for every 100 tons per hour capacity.

Remember, that Heavy-Media Separation units are operating profitably on the middlings and refuse from previously installed mechanical cleaners.

Remember, also, that many of the newest preparation plants (including an ultra-modern coking coal washer of 25,000 tons

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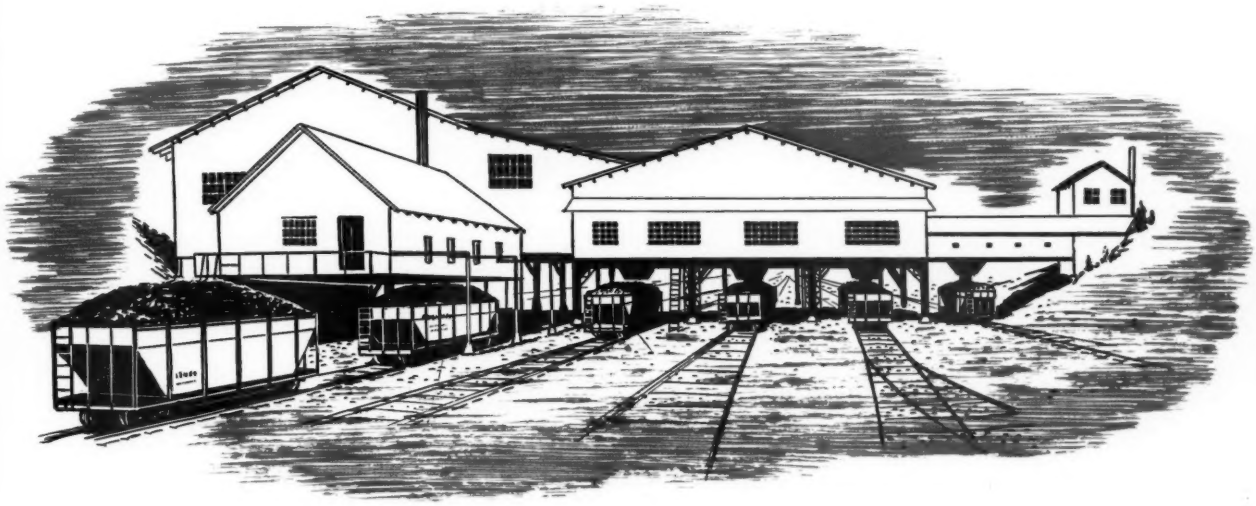

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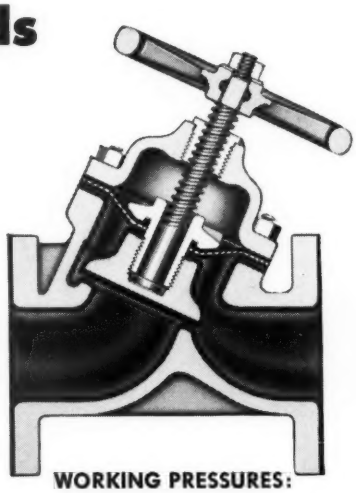

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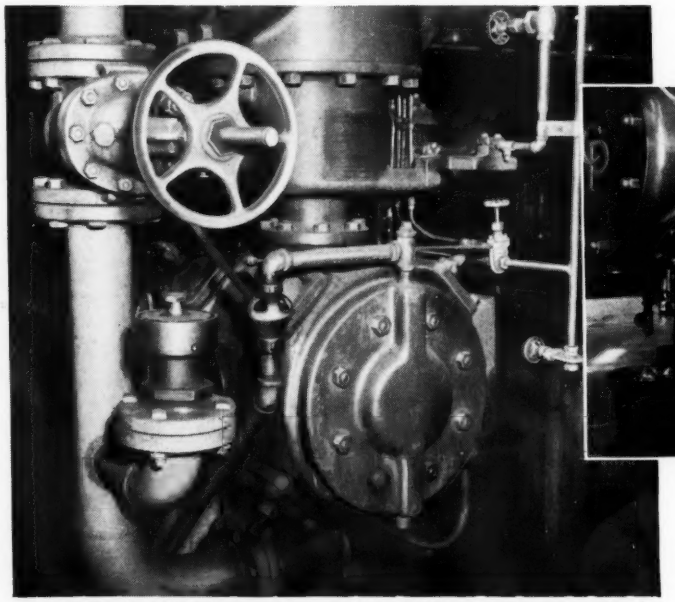

AIR LIFT CONTROL *to secondary cone in coal preparation plant. Crane equipment includes gate valves, globe valves, clamp gates and flanged fittings.*

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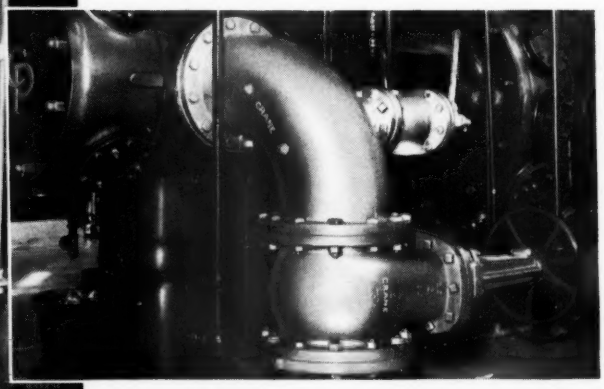
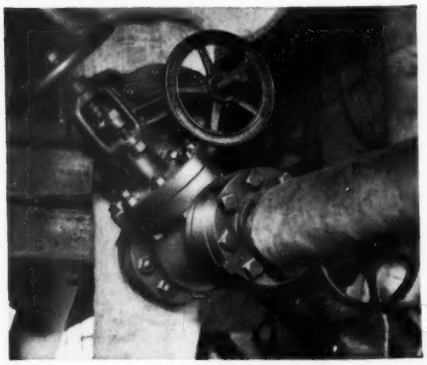


LINES TO CLOSED FEED *hot water heater showing Crane 4-in. steel gate valves.*



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1½' x 3' Double-Deck Denver - Dillon Vibrating Screen, right-hand drive, showing how 1½' x 3' screen can be mounted on frame with casters.

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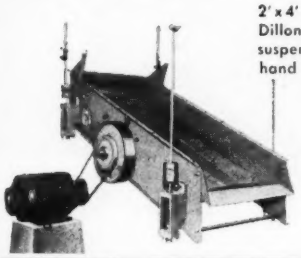
$338	Weight 225 lbs.	Price $89 Weight 108 lbs.

1½' x 3' Double-Deck

Bare Screen		Add for ¾ H.P. motor, motor mounting and drive.
$371	Weight 350 lbs.	Price $101 Weight 122 lbs.



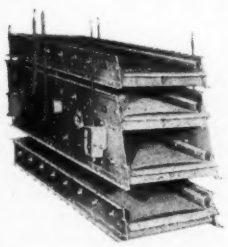
2' x 4' Single-Deck Denver-Dillon Vibrating Screen, suspension mounting, right hand drive.

2' x 4' Single-Deck

Bare Screen		Add for ¾ H.P. motor, motor mounting and drive.
$432	Weight 350 lbs.	Price $101 Weight 122 lbs.

2' x 4' Double-Deck

Bare Screen		Add for 1 H.P. motor, motor mounting and drive.
$473	Weight 600 lbs.	Price $117 Weight 135 lbs.



3' x 6' Double-Deck Denver - Dillon Vibrating Screen showing how additional deck may be added. Undersize hopper and dust or top cover may be added.

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3' x 6' Double-Deck

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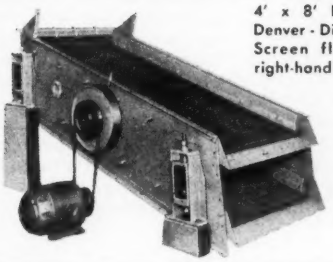
$954	Weight 1200 lbs.	Price $168 Weight 180 lbs.



4' x 8' Double-Deck Denver - Dillon Vibrating Screen floor mounted, right-hand drive.

4' x 8' Single-Deck

Bare Screen		Add for 3 H.P. motor, motor mounting and drive.
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4' x 8' Double-Deck

Bare Screen		Add for 5 H.P. motor, motor mounting and drive.
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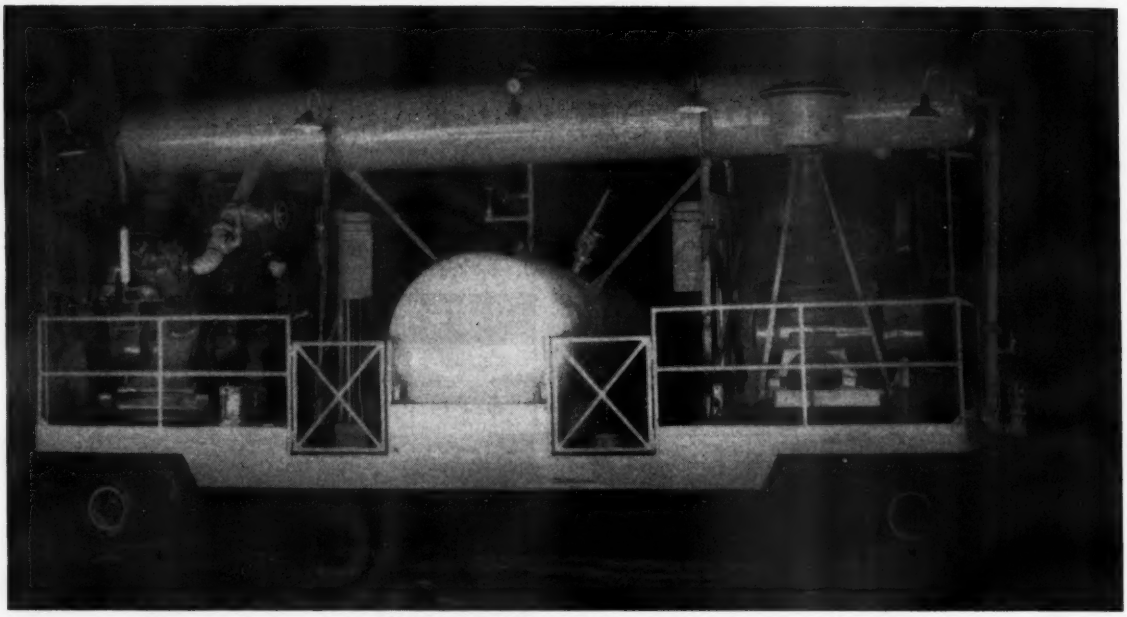


Mobile utility station eliminates pipe lines

A Mobile Utility Station

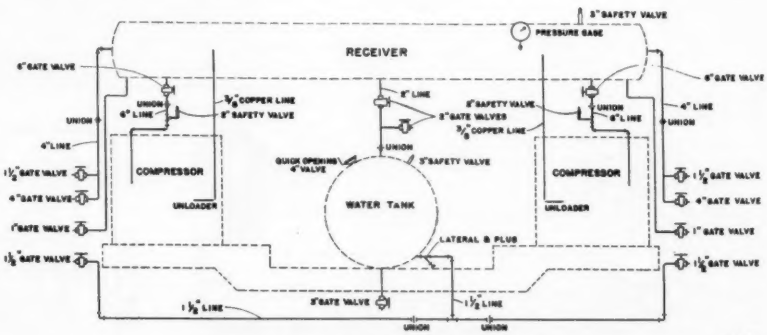
Bureau of Mines Engineers Develop Unit to Serve Four-Drill Jumbo

By FRED D. WRIGHT and HOMER J. BALLINGER
Mining Engineers
U. S. Bureau of Mines

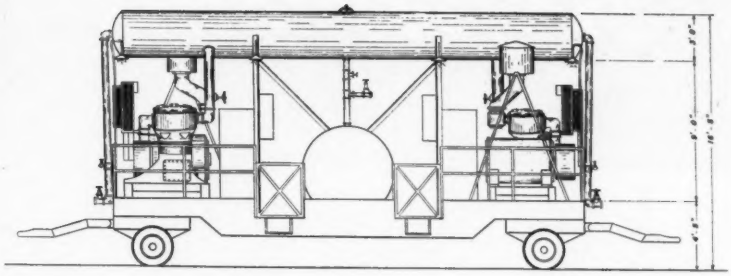
THREE thousand feet above the Colorado River in the Rifle-DeBeque area of western Colorado the Bureau of Mines, U. S. Department of the Interior, has opened an experimental mine in the oil-rich beds of the Green River formation. This mine was developed to demonstrate the most economical methods and practices for mining oil shale on a commercial scale.

The Bureau's oil-shale mine is developed to exploit a series of flat-flying beds 73 ft thick in three levels by room-and-pillar methods. The top 27 ft of the 73-ft bed is being mined as an advance heading; and two benches, each 23 ft high, will follow the advance of the top level. The mine is developed on a checkerboard pattern, with headings and crosscuts 60 ft wide and pillars 60 ft square.

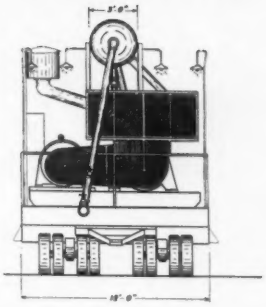
From the beginning of its work on oil shale, the Bureau of Mines recognized that unusually low mining costs must be obtained before an oil-shale enterprise would be commercially successful. Since it was anticipated that one of the principal costs in mining the shale would be the cost of drilling blast holes, much of the early work was directed toward the developing of suitable drilling equipment. As a result of this early work, a multiple-drill carriage mounting four pneumatic rock drills was designed and fabricated. This multiple-drill carriage or "jumbo" has been in use in the Bureau's mine for over a year. Soon after it was put into operation, it became apparent that the available stationary compressor plant did not have adequate capacity to efficiently supply the four-drill jumbo and still provide air needed for other mining operations. An additional source of compressed air was therefore necessary. Past experience had shown that the cost of supplying compressed air to the underground areas through pipe lines from stationary compressors on the surface is exceedingly high owing to the cost of installing and maintaining the lines. It was decided, therefore, to design and construct a mobile compressor-utility unit which could



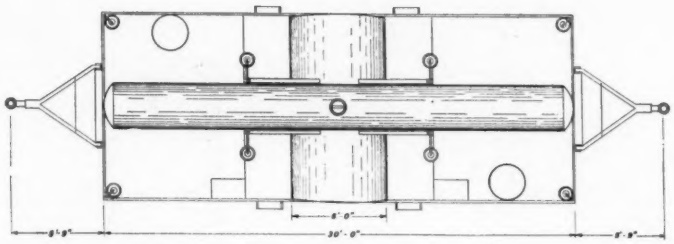
Piping diagram of mobile utility station



SIDE ELEVATION



END ELEVATION



PLAN

Mobile utility station of similar design might well be applicable to many mining operations

be towed to the underground working area, thereby eliminating the necessity for installing pipe lines.

Pipe Lines Eliminated

The preliminary general design and operating specifications of the unit were made by engineers of the Bureau of Mines, and detail design and fabrication were done on contract by the Winter-Weiss Co. of Denver, Colo. The Construction and Maintenance Section of the Bureau's oil-shale plant did all the electrical work. The mobile utility station consists essentially of two 770-cfm air compressors, a 2500-gal water tank, and a 200-cu ft receiver mounted on a 30-ton trailer. Although quite large, the unit is maneuverable and may be towed from either end with a dozer or heavy truck. Once the unit is in position, it is an easy matter to connect the air and water lines from the jumbo to the near end of the compressor and to plug the trail cable into the 2300-v mine circuit.

A drawing of the mobile utility station, shows the most important dimensions and the location of compressors, tanks, piping, and valves. The mobile base of the unit is a 30-ton, drop-frame trailer 30 ft long and 12 ft wide. The trailer is equipped with an eight-wheel steering dolly at each end. These dollies have individual air-operated locks so that the towing dolly can be left free to turn and the traveling dolly locked to the trailer. The tow bars provided on each end of the trailer are hinged so that they may be folded out of the way when not in use. The trailer is equipped with hand-operated air brakes. A pipe guard rail 42 in. high encloses the trailer platform.

Two Y-type, two-stage, double-acting, model WN-102-B:14-8 x 7 Joy-Sullivan air compressors are mounted on the gooseneck ends of the trailer. They are designed for operation at 8000-ft elevation. Each compressor has a piston displacement of 930 cfm, a rated free-air output of 770 cfm, and a maximum operating pressure of 125 psi. They are both equipped with an oil-bath filter and with automatic unloading devices operated by mercury switches. They are water-cooled by a self-contained cooling system with sectionalized radiators. An intercooler is used between the two stages of compression but no aftercooler is used.

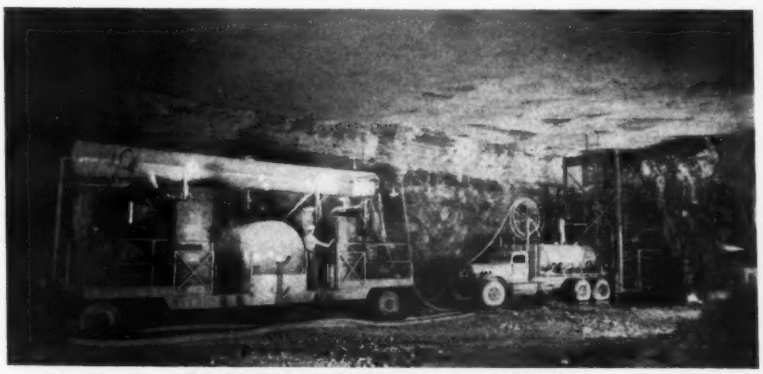
The compressors are driven through v-belt drives by 150-hp, 2300-v, three-phase a-c, totally enclosed, squirrel-cage induction motors. The circuits for each motor are separately fused and carried to oil-immersed magnetic starting equipment which provides overload and low-voltage protection. A third circuit is carried through a step-down transformer to provide lighting and convenience outlets.

Energized Coupler Assures Safety

The trail cable from the unit is a 5000-v cable containing three No. 4, shielded, flexible conductors and three ground wires. A 5000-v General Electrict coupler plug is attached to the end of the trail cable, and coupler sockets are provided at various points in the mine distribution circuit. The plug and socket couple together with a positive interlock in such a manner that the coupler parts cannot be connected or withdrawn while energized. The unit is grounded to the mine grounding system, and the measured resistance between the unit and the ground point is less than 0.1 ohm,

A 2500-gal water tank for providing drilling water is mounted at the center of the trailer. The tank is 6 ft in diameter and 12 ft in length. Mounted over the long axis of the trailer and above the compressors and water tank is an air receiver 30

(*Continued on page 60*)



Supplying compressed air to a four-drill jumbo

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JEFFREY LOCOMOTIVES

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One of the new streamlined locomotives is shown above. It is an 8-ton explosion tested job.

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Electric locomotives operate on Diesel power on bench tracks

Diesel-Electric Locomotives at Ajo

How Auxiliary Power on Trolley Equipment Eliminated Need for Electrifying Miles of Bench Track and Raised Operating Efficiency

By ALFRED T. BARR
General Superintendent
New Cornelia Branch
Phelps Dodge Corp.

DURING the past 32 years the Phelps Dodge Corp. has produced 130,000,000 tons of copper ore and 94,000,000 tons of waste rock from its open pit mine at Ajo, Ariz. The current daily rate of production is 28,000 tons of ore and 19,000 tons of waste. Recently, the rail haulage system was modernized by the construction of a new main line from the lowest operating level of the pit to the crushing plant. Tracks on this line and on the existing approach to the waste dumps were electrified and steam locomotives were replaced by trolley-electric locomotives. The new trolley-electric locomotives were each equipped with two 325-hp Diesel engines that furnish power for operation over bench tracks in the pit and other non-electrified tracks in the haulage system. The installation of Diesel engines for auxiliary power on the locomotives eliminated the necessity for electrifying some 23 miles of track, and avoided the operating difficulties that would have attended complete electrification of the haulage system. This type of locomotive has proven to be a flexible unit, and has performed satisfactorily under varied conditions of haul over the electrified and non-electrified tracks.

Production Derived from Nine Levels

The New Cornelia open pit now covers an area of about 320 acres and has reached a depth of 400 ft below the average rim elevation. At present there are nine active mining levels in the pit. The levels are designated by their sea-level elevations, the topmost active level now being the 1820 and the bottom level the 1460. The normal vertical interval between levels is 40 ft. The width of the mining benches varies from a minimum of 80 ft up to several hundred feet. Material to be mined from the banks between the mining benches is broken with powder charges loaded and detonated in a series of churn drill holes,

and electric shovels equipped with 4½-cu yd dippers load the broken material into 30-cu yd, side-dump, standard-gauge railroad cars holding approximately 61 tons, and made up into five-car trains. The average haul from shovels to crushers is 2⅓ miles and from the shovels to the waste dumps is 3 miles.

Seventy-ton, 800-hp steam locomotives were the principal rail motive power until they were replaced by electric locomotives upon completion of electrification of the haulage system in the fall of 1947. The steam locomotives were supplemented with three 125-ton 1000-hp Diesel-electric locomotives during the last two years of their operation, and the use of these units was continued after electrification of the haulage system. The rail motive power for the pit consists of seven 125-ton, trolley-electric locomotives equipped with Diesel auxiliary power for operation over non-electrified tracks, and three 125-ton, 1000-hp Diesel-electric locomotives. The electric locomotives are used principally for ore haulage from the lower levels of the pit, and the Diesel-electrics, for waste haulage from the upper levels and for switching service. Two additional Diesel-electric locomotives are on waste haulage service.

Electrified Track Has Three Percent Grade

The mine track system consists of a main line from the crushing plant to the bottom level of the pit, bench tracks connecting with the main line at the mining levels, an approach to the waste dumps, dump tracks, various yard tracks, and a connecting track with the plant tracks.

Prior to the electrification of the haulage system the main line had a ruling grade of two percent, adverse to the loaded trains. It was double tracked with 90-lb rail from the crushing plant to within one level of the bottom of the pit with crossovers and turnouts at the active mining benches. The distance from the crusher to the 1500 level, which was the bottom level in 1947, was 3½ miles. The maximum speed attained by the steam locomotives when hauling a train of five loaded cars up the main line was about 10 miles per hour, and the time consumed in making a trip from the 1500 level to the crushing plant was about 24 minutes.

The electrified main line was built on a ruling grade of three percent, adverse to the loads. It is double tracked; the track in the upper section, about 1¼ miles in length, being constructed with 112-lb rail, and that in the lower section with 90-lb rail. Both tracks as well as the crossovers and about 200 ft of all the turnout tracks are electrified. The distance from the crushing plant to the 1500 level is 2¼ miles. The maximum speed attained by the electric locomotives when hauling a train of five loaded cars up the main line is 17 miles per hour compared with the 10 miles per hour for the steamers on the old two percent grade, and the time consumed in making the load trip from the 1500 level to the crusher is about nine minutes.

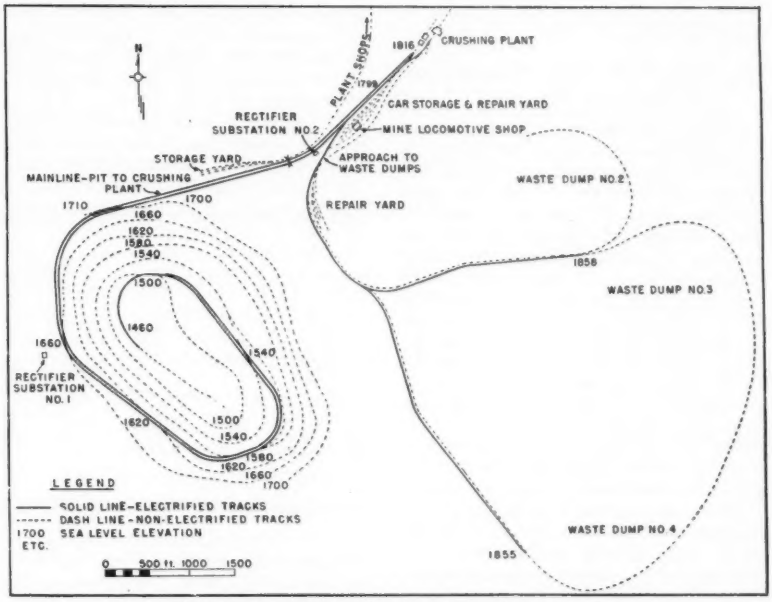
Single tracks are maintained on the mining benches to serve primarily as loading tracks for the shovels. These bench tracks are unelectrified, and are built with prefabricated panels in order to facilitate removal and relaying. On the average, about 1200 ft of bench track is relocated daily to conform with blasting operations and keep track within the loading radius of the shovels as successive cuts are made along the banks being mined. In most instances, it is necessary, before a bank is blasted, to remove the section of bench track opposite the blast in order to clear the throw of broken material. Afterwards, the section of track is relaid to serve as the loading track for the shovel during the first cut through the ground broken by the blast. Bench track is maintained completely around the pit on most levels, and in such cases empty trains may be routed into a shovel via one turnout on the main line and loaded trains routed back to the main line via the opposite turnout. However, on some levels, bench track can be maintained on one side only. In this case, empties to the shovel and loads from the shovel travel the same stretch of track between the main line and the shovel. The total length of bench track in the pit at the present time is 11.4 miles.

The approach to the waste dumps leads off the main line a short distance up grade from the entrance to the pit, and at a point 2300 ft from the main line it branches into two lines that connect with the temporary tracks along the crest of the waste dumps. The dump approaches are on a ruling grade of two percent, adverse to the loaded trains. They are double-tracked and constructed with 90-lb rail. The load track only is electrified. The total length of double-tracked dump approach line is 1¾ miles.

Dump tracks are unelectrified and, like the bench tracks in the pit, are shifted frequently. But unlike the bench tracks they are built with staggered rail joints so that long sections of track can be shifted with a track shifter whenever it becomes necessary to relocate the track. On the average, about 700 ft of dump track is shifted daily. The total length of dump track at the present time is 2.7 miles.

The balance of the track system including yard tracks, the upper section of the old main line, and connecting tracks is unelectrified and has a total length of 7.2 miles.

There is at the present time a total of 29¼ miles of single track in the mine system, 6¼ miles of which is electrified and 23 miles unelectrified.



Mine track system at the New Cornelia open pit

Trolley System

Power is transmitted at 13,200-v a-c from the power house to two automatic d-c rectifier substations at the pit. The substations supply d-c to the trolley system at a nominal voltage of 1500 v, and each has a 1580 kw Ignitron mercury arc rectifier having a full load capacity of 950 amp. The rectifiers will maintain 150 percent

rated current capacity for two hours, and 300 percent for five minutes. The output voltage is constant at 1660 v up to 150 percent load and drops to approximately 1330 v at 300 percent load.

The overhead trolley is supported along the upper or permanent section of the main line by steel bridge-type structures, and along the lower section by wood poles with steel cable cross spans. The trolley along single tracks is supported by wood poles with bracket arms. A 350 M cir mils copper contact wire hung from a 500 M cir mils copper messenger cable is used where current demand is high, and 4/0 contact wire supported at the structures only and fed from a 750 M cir mils auxiliary feeder cable carried along the wood poles on one side of the track is used where current demand is low.

Factors Affecting Choice of Motive Power

During the course of the studies on the modernization of the haulage system, it was decided that trolley-electric locomotives would be the most suitable units for the main part of the haulage job, which consists of hauling loaded trains up the heavy grades on the main line to the crushing plant and the approach tracks to the waste dumps. The problem then became one of deciding whether the locomotives would be straight electric necessitating the electrification of practically all tracks in the haulage system, or whether they would be provided with auxiliary power for service over bench and dump tracks and other non-electrified tracks in the system.

It was recognized that straight electric locomotives were standard equipment with proven performance and low operating and maintenance cost records on many rail haulage operations; however, there were serious disadvantages to electrifying some of the tracks in the New Cornelia system. It was believed, for instance, that the maintenance of trolley along the bench tracks, which had to be removed and relaid to conform with blasting and shoveling operations, and the maintenance of trolley along loading tracks for drop-cut and other shoveling operations where bench room is restricted, and along the temporary dump tracks would be expensive and at times cause serious operating delays. The installation of trolley at the crushing plants where there was interference from overhead cranes and other equipment was also a difficult problem. Added to the maintenance, operating and installation disadvantages of complete electrification was the cost of electrifying some 20 miles of bench, dump, yard and other tracks which were either level or on comparatively light grades. It was decided that the better solution to the problem was to electrify only the main line and dump approaches, and provide auxiliary power on the locomotives for operation on non-electrified tracks in the system.

Diesel engines were selected for auxiliary power on the locomotives, and it was determined that a maximum of 650 hp, either in one 650 hp unit or two 325 hp units, could be installed on a standard trolley-electric locomotive without exceeding a maximum locomotive weight of 125 tons. This was more auxiliary power than was necessary for haulage over comparatively level bench and dump tracks, but at times it could be fully utilized for haulage over grade tracks where it was difficult to install trolley. As the two smaller Diesel units could be designed for individual or simultaneous operation and thereby cover a wide range of power requirements, the installation of a maximum amount of auxiliary power was considered warranted.

The combination trolley and Diesel-electric locomotive which was built was designed to perform under various conditions of haul as follows:

			Diesel Operation (2—325-hp engines)			Trolley Operation (Nominal voltage 1500-v dc) Full Field		Shunted Field	
Five-Car Train	Trailing Load Tons	Tractive Effort Lb	Gen. Amp	Motor Amp	Speed Mph	Motor Amp	Speed Mph	Motor Amp	Speed Mph
Level Track	475	7,800	395	168	17.5	130	23.4	168	28.8
2% Grade.	475	31,820	735	342	5.0	342	14.6	396	16.7
3% Grade.	475	42,875	900	432	3.4	432	13.3	485	15.0*

*Actual performance was 17 mph, thus exceeding that calculated

The locomotive has two articulated, four-wheel trucks with a traction motor mounted on each of the four axles and driving the axles through single reduction spur gearing. Power is supplied to the traction motors from either overhead trolley, or from one or both of two Diesel, engine-driven, d-c generators. When operating under trolley power, the two motors on each truck are series connected; the two groups of motors being connected in series for slow speeds and in parallel for high speeds. When operating on Diesel power the two traction motors of each truck are connected in parallel across the associated generator, and the locomotive speed is governed by the speed of the Diesel engines. Trolley and Diesel power can not be applied to the motors simultaneously, but changeover from one source of power to the other is a simple and quick operation.

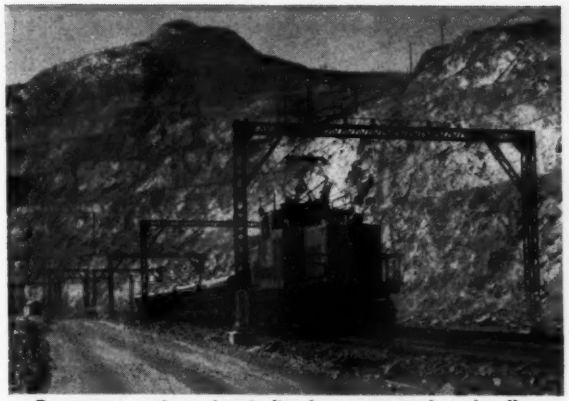
An operator's station with equipment and instruments for complete control of the operation of the locomotive is located in a cab at the center of the locomotive, and a current-collecting pantograph is mounted on the roof of the cab. One Diesel engine is mounted at either end of the locomotive, and generators, compressors, electrical and other control equipment are located in two compartments, one between each Diesel engine and the cab.

The Diesel engines are four-cycle type with six cylinders of eight-in. bore and nine-in. stroke. The idling speed of the engines is 400 rpm, and the maximum speed is 1200 rpm. The engines are rated at 325 hp.

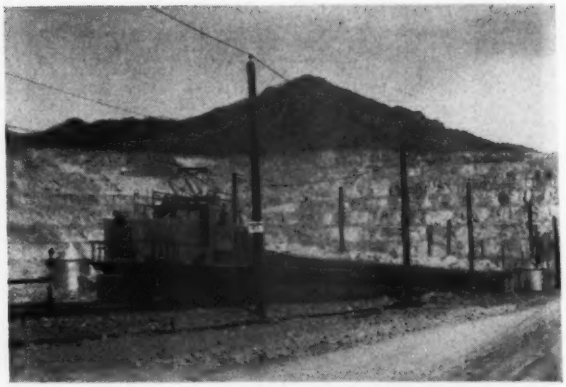
Haulage Unit Operation

Three of these locomotives went into regular service upon completion of the new main line in September

Locomotives are inspected semi-monthly in a fully-equipped shop



Permanent sections of main line have structural steel trolley supports



Temporary sections of main line use wood pole and cable span trolley structures

1947, and the other four at intervals during the next four months. Up to July 1, 1949, the seven locomotives had worked a total of 10,235 locomotive shifts and had hauled 18,253,000 tons of material at an average rate of 1783 tons per locomotive shift. The average distance hauled was 2.46 miles, and the average lift was 264 ft. Electric power consumption was 1152 kwhr per locomotive shift. Diesel fuel oil consumption was 30.9 gals per locomotive shift.

A typical haulage cycle for the electric locomotives serving an ore shovel on the 1500 level is as follows:

Phase of Cycle	Motive Power	Time
(a) Spotting cars being loaded by shovel	Diesel-electric	40 min
(b) Load trip to crusher:		
(1) ¼ mile bench track	Diesel-electric	2 "
(2) Up 2¼ miles main line, 3% maximum grade	Trolley	9 "
(c) Spotting cars being dumped at crusher	Diesel-electric	5 "
(d) Return trip to shovel:		
(1) Down 2¼ miles main line	Trolley	7 "
(2) ¾ mile bench track	Diesel-electric	5 "
Total time excluding delays		68 min

One of the two Diesel engines on the locomotive can furnish sufficient power for all phases of this cycle excepting the load trip on the bench from the shovel to the trolley. The practice is therefore to run one engine continuously, and use the second engine only as needed. The second engine is usually started as the fourth car in the train is being loaded, and both are then operated until the trolley is reached, when the second engine is shut down for the balance of the cycle. The engines are alternated on continuous and intermittent operation every shift. On trips to the waste dumps both engines are operated for the load trip over the dump track in addition to the load trip over the bench track in the pit.

The speed attained by trains on bench and dump tracks is dependent upon the condition of the track but averages about 10 mph. The maximum speed up the main line is dependent upon trolley voltage and amount of load on the cars, and varies from 15-17 mph over the three percent grade section. The maximum safe speed down the main line is limited by the braking power on the locomotive and cars and is about 25 mph.

One new level, the 1460, was established after electrification of the haulage system, and 572,000 tons from the drop-cut operations was handled by the electric locomotives under Diesel power before the trolley was extended to the new level. This material was hauled from the drop-cuts to the end of the trolley on the 1500 level over tracks with a maximum grade of three percent. The longest grade haul was for a distance of 1200 ft with an average grade of 2.7 percent. This was the most severe test made to date of the auxiliary power on the electric locomotives, and the performance of the locomotives under these conditions was satisfactory.

Servicing of the locomotives, periodic inspections and minor repairs are made at the mine locomotive shop. Major repairs and annual overhauls are done in the main shop at the plant. The locomotives are serviced daily, at which time the necessary fuel and lubricating oils and engine cooling water are added and minor defects which may have been reported by the operators during the previous 24 hours are remedied. Each locomotive is brought into the shop for one eight-hour shift about every ten operating days, and during that time it is inspected, Diesel engines are cleaned, oil and intake air filters are changed, and electrical and mechanical repairs are made. The availability of the locomotives calculated on the basis of hours worked out of the possible hours of scheduled operation is 95 percent.

Locomotive Specifications

Wheel arrangement	0-4-4-0
Total weight	125 tons
Length between coupler knuckle faces	47 ft, 4 in.
Height, rail to top of cab	14 ft, 11 in.
Height, pantograph locked down	16 ft, 10 in.
Width over-all	10 ft, 7 in.
Maximum trolley wire height	24 ft
Minimum trolley wire height	18 ft
Rigid wheel base	9 ft, 6 in.
Total wheel base	29 ft, 7½ in.
Minimum curve, two locomotives coupled	40 deg
Minimum curve, locomotive hauling cars	50 deg
Diameter wheels	40 in.
Gauge	4 ft, 8½ in.
Gear Ratio	16:59
Fuel oil capacity	320 gal

Looking north at the New Cornelia pit

Experimental model of an electrically-operated dust collector used when drilling dry

Dust Control In Mine Roof Drilling

Conference Discussion Reveals Problems and Indicates Their Solution

TO consider the question of dust control when drilling for mine roof bolts, the U. S. Bureau of Mines held a conference in Washington, D. C., on January 17. A group of 37 men attended—coal operators, equipment manufacturers, and representatives of several national associations. An informal discussion followed the presentation of prepared statements by several of the Bureau officials. The discussion was most constructive in setting forth the dust problems that the industry faces. However, as the seriousness of the dust problem in coal mine roof drilling has only recently been recognized, the meeting did not result in definite recommendations. The coal mining industry has faced and solved many problems, and there is every reason to believe that an effective method of dust control will be found.

In opening the meeting, Dr. James Boyd, director of the Bureau, stated that up to January 1950, some 714,000 roof bolts have been installed in 200 coal mines of the United States and were supporting 14,000,000 sq ft of roof surface. Attention has been centered on demonstrating that bolting is a practical method for mine roof support, and in perfecting the technique for drilling and setting the bolts. However, the industry should now realize that dust from drilling is a potential hazard, and in outlining the purpose of the conference Dr. Boyd said:

"The Bureau of Mines became interested in roof bolting primarily from the standpoint of safety and the conservation of natural resources. We can foresee in this new technique of roof control the possibility of making more substantial progress in the prevention of accidents from falls of roof. Such progress, however, will depend upon the intelligence used in roof-bolt applications. . . . We are deeply concerned whether the Bureau on one hand is sponsoring a method that will reduce injuries from falls of roof in coal mines or, on the other hand, a method that will jeopardize the health and safety of workmen through the creation of hazards that formerly did not exist. We believe that the equipment manufacturers can rectify this situation and are confident that when they become fully aware of the needs of the coal industry, they will provide the necessary equipment to install roof bolts safely and efficiently."

Health Hazards

The first item on the agenda of the meeting was the presentation of a prepared paper "Health Hazards Incidental to Roof Bolting," by J. J. Forbes, chief of the Health and Safety Branch of the Bureau. Beginning with the statement that roof bolting marked the first real advance against roof fall accidents in coal mining, he said in part:

"In promoting the adoption of roof bolting in coal mines, the Bureau, from the outset, has been aware of the health hazard introduced by drilling in silica-bearing formations and it was presumed that after a trial installation of roof bolting the mine operator would take the necessary steps to control the dust hazard. It was believed that approved dust respirators would afford ample protection temporarily until the practicability of roof bolting could be determined in each case, after which a more effective means to reduce the dust hazard would be adopted.

"The Bureau does not have much

data (qualitatively or quantitatively) on dust produced during the drilling of roof in coal mines, but enough information is available to venture the conclusion that dry drilling either with percussion or rotary drills is dangerous unless some practical method is devised to control the dust and prevent its dispersal into the mine atmosphere.

"The average maximum allowable concentration of dust to which men should be exposed is 20,000,000 particles per cubic foot of air for an eight-hour shift, and the maximum concentration for any single operation should not exceed 40,000,000 particles. When the dust contains free silica, not more than 5,000,000 particles of it should be present in the above limits of concentration.

"Many in the industry harbor a misconception that the only persons exposed to the dust hazard are those who are doing the drilling. Actually, the fine float dust is carried in the ventilating current and the health of all persons 'down-wind' from a drilling operation may be jeopardized. Recently, a sample was collected at a working place adjacent to and downwind from where roof holes were being drilled; it contained 60,000,000 particles of dust with 40 percent free silica or 24,000,000 particles of free silica per cubic foot of air. This exceeds the maximum allowable limit of 5,000,000 particles, and health of persons working in this atmosphere was jeopardized.

"The only satisfactory method, employed at this time, of controlling dust evolved during the drilling is the use of water in conjunction with pneumatic percussion drills. . . . Inasmuch as most coal mines are equipped with electric power, the most desirable tool would be an electric rotary drill equipped with adequate dust control facilities. . . . I urge you to underscore the dust-control aspects of rotary drilling, because this problem presents a challenge, the solution of which may determine the future of roof bolting as applied to coal mines. It is hoped that through discussions here today, a clearer understanding of the drilling requirements will be obtained and that a satisfactory method will be developed for which manufacturers can provide the necessary equipment."

Technical Considerations

Following the statement of Mr. Forbes, a paper was read by Edward M. Thomas, engineer in charge of the Roof Control Section of the U. S. Bureau of Mines. Extracts are given herewith:

Dust abatement, where needed, is essential to forwarding wide acceptance of roof bolting

"It is estimated that 60 percent of the roof rocks overlying coal beds can be drilled by rotary drills equipped with the newer carbide-alloy bits. Rotary drills have not been used successfully where as little as a 1-in. stratum of consolidated sandstone or even occasional occlusions of pyrites must be penetrated. Prior to the introduction of roof bolting compressed air was used in bituminous coal mines only occasionally, such as for drilling roof rock in haulage entries in some low-coal mines. Such drilling usually was done with small hand-held, hammer-type drills supplied with compressed air from portable compressors, frequently of low capacities that were designed for intermittent service."

With compressed air drilling, water can be introduced to prevent the formation of dust. This method implies the use of the wedge type of anchor bolt and a large percentage of installations today use this type of equipment, which Mr. Thomas discussed as follows:

"Although the slit-rod-and-wedge type of anchor bolt does not afford an entirely satisfactory installation, nevertheless it is used widely and its use is likely to continue for some time. It has the following disadvantages:

"Very close tolerances must be observed as to depth of hole, requiring close supervision. If the hole is too long the bolt will not seat properly and is therefore worthless for roof support. If the hole is too short, too much of the bolt will protrude from the hole.

"Sometimes considerable experimentation is required to determine the correct size of wedge with respect to the diameter of hole.

"Bolt diameters less than 1 in. are not recommended because the amount of metal removed in making a slot (⅛ in. wide) is constant, and with bolts less than 1 in. in diameter the base of the slot is a point of weakness.

"At best it provides a very small actual bearing surface and in rocks wherein plastic flow is a factor the bolt will not maintain its tension.

"Advantages of the slit-rod-and-wedge type of bolt, if properly installed, are:

"It cuts a dovetail while being driven home and in tension, the bolt will fail before it can be pulled out of a hole. In a series of hydraulic-jack pull tests made by a large user of these bolts, the average failure in tension was at 13.5 tons. These tests are made on bolts that were selected at random and had been installed at least six months.

"It is not patentable and may be purchased on a free market.

"In the first experimental installations of roof bolts in coal mines, the possibility of failure of the method was of such concern to the mine officials that it was very difficult to encourage them to request from their respective companies additional appropriations for water pipe lines or tank cars. Frankly, we considered that it

(*Continued on page* 60)

Tightening roof bolt nut with pneumatically-driven impact wrench. The respirators are used when drilling

11 REASONS

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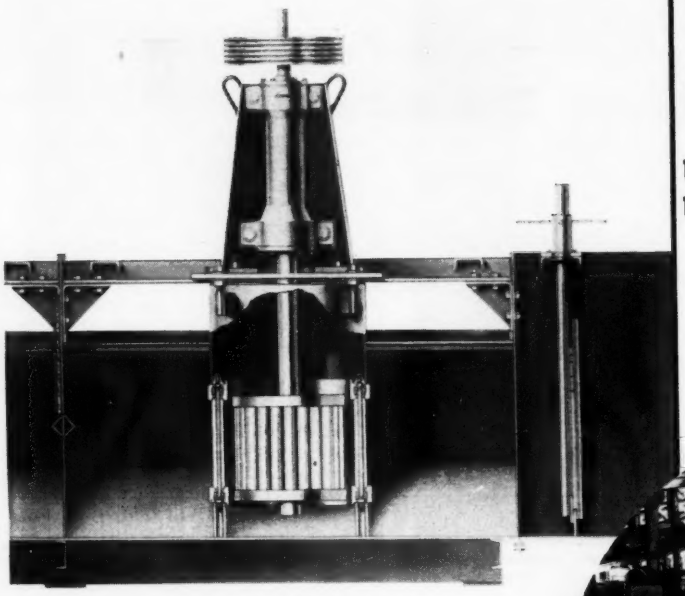

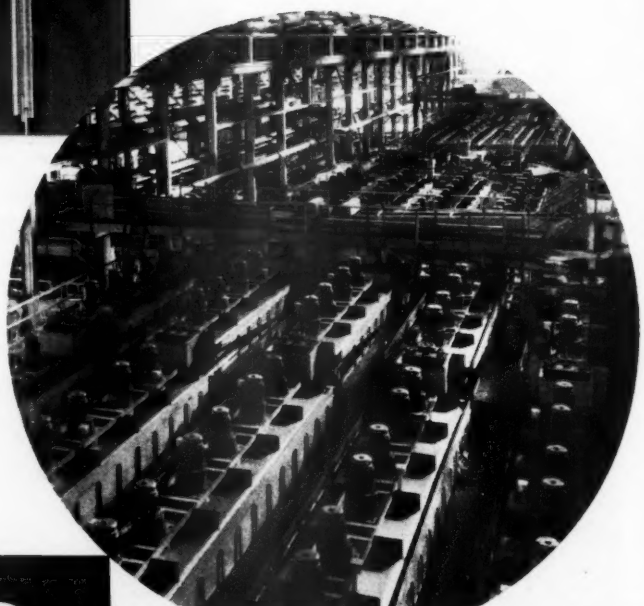

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Reversing Conveyor Belts

Belt Reversal to Transport Men and Supplies Into Working Panels Is a Controversial Question. This Report Describes a Successful Application

By HARRY W. MEADOR

THE operation described in this report mines a 39-in. seam of coal. In general, the conditions are favorable and the outstanding feature is a hard sandstone roof about 30 ft thick which is practically impossible to break even over large worked-out areas. To mine successfully under this condition involved considerable experimentation. The present system, which has been used successfully for a number of years, was evolved through experience.

In 1930, the first underground belt conveyors were installed at this mine, soon after the property was opened. The system is one of the early examples in our country of a belt "mother conveyor" for a gathering unit between the room neck and the main line mine car haulage. This mine was also among those that tried long-face mining in the early days of coal mechanization, and the first operation consisted of two 26-in. belt conveyors, each 400 ft long extending across an 800-ft advancing longwall face. One conveyor handled coal from the mid-point of the face to the right side and the other from the mid-point to the left side, discharging in trips of mine cars at loading stations in the two parallel headings which were 800 ft apart. The difficulties, both practical and economical, encountered from the roof action were such that the long-face system was soon discontinued.

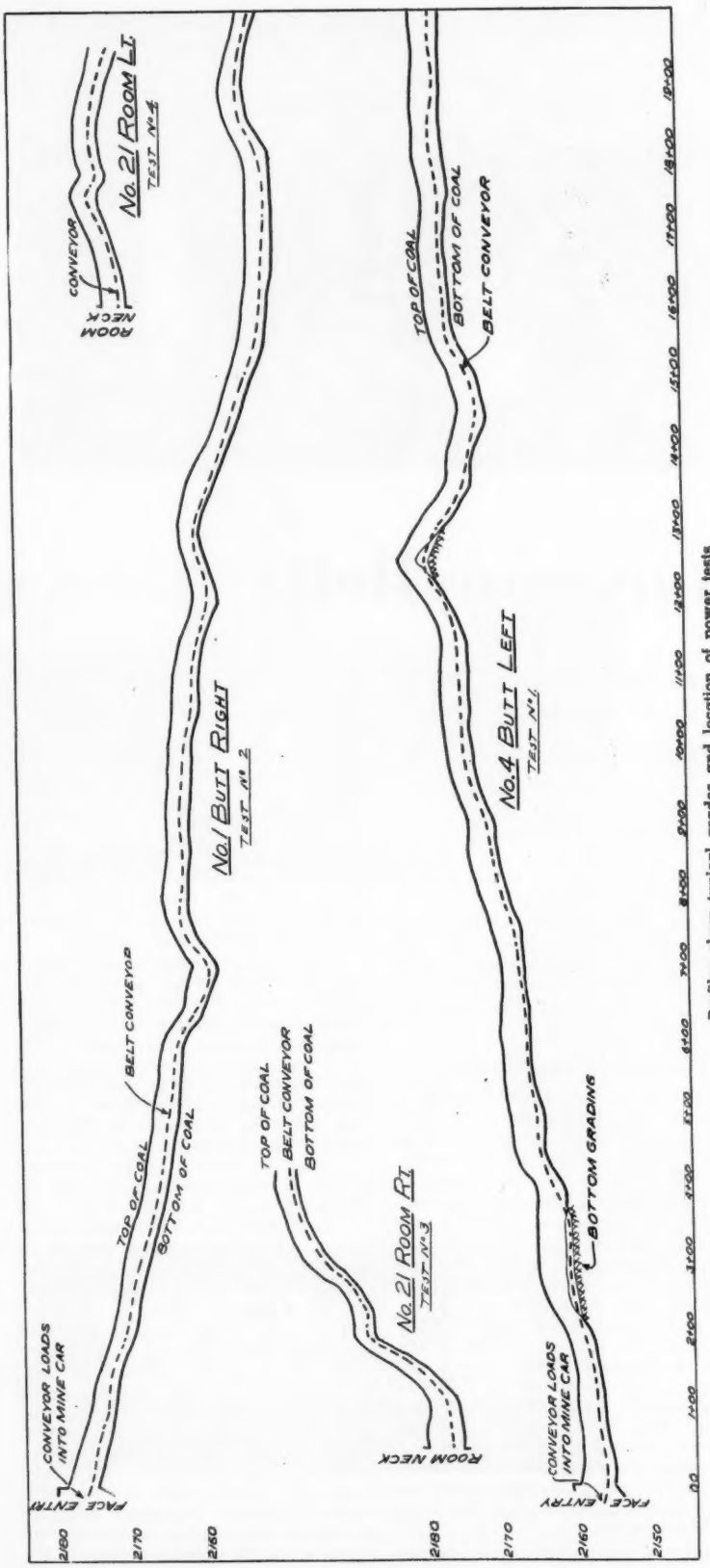
Present Mining System

In the latter part of 1931, based on the experience gained from the longwall experiments, a system of wide rooms with comparatively narrow pillars was adopted—the idea being to recover as high a percentage of coal as possible, but leaving sufficient support to maintain the workings and prevent squeezes or creeps. In this installation, chain face conveyors, 18-in. room belt conveyors, and 26-in. mother belt conveyors transported the coal from the face to the main line mine car haulage. This system, although much improved, is followed today; room lengths and heading lengths have been increased as more efficient equipment was developed and the mother conveyors are now 30-in. belts. The general arrangement is shown on the accompanying sketch of the mining plan.

From the beginning to the present time, we have practiced reversing belt conveyors to transport supplies and began transporting men in 1936. A question has been raised as to the practicability of this procedure. Our experience over 20 years convinces us that it is practical and economical to reverse our conveyors. Some systems of conveyor mining would require more transfers of supplies than others, and it is conceivable that some mines would find some other method, such as rubber-tired tractors, more economical for the handling of supplies.

A description of our mining system and procedure as presented in this report should help to illustrate our stand on this question. The haulage roads are brushed to give 6-ft clearance from rail to roof on main and face headings. A 30-in. belt conveyor is used in the room headings, loading into a trip of mine cars on the face entry. The maximum length for this conveyor is 2200 ft; the standard length of room headings is 2050 ft. Standard rooms are 75 ft wide on 105-ft centers, with 18-in. belts in six rooms. These rooms are worked in opposite pairs, one to the right and one to the left with one operator caring for a pair of units.

There are times when it is found advantageous to drive a room entry 4000 ft and use two 30-in. conveyors in tandem. This does not often occur and when it does there is, of course, an additional transfer point. Ordinarily we make but one belt transfer which is from the mother belt to the room belt. When there are two conveyors in tandem, one man is assigned to stop at the transfer and assist the operator of the second conveyor in the



Profiles show typical grades and location of power tests

transfer of supplies. There is no delay at this point.

Transporting Men and Supplies

Supplies are taken in at the beginning of each shift only and the sequence for hauling men and supplies is as follows:

The mantrip from the outside arrives at the loading point where the men going to the face get on the belt which is not running. Men for the inby places load up first; then the belt is moved far enough to allow another group to load. When the head man reaches the room neck he stops the belt and all men get off and proceed to their working places. Approximately 15 minutes are required to load and transport the men on the mother belt.

Supplies are then loaded onto the moving belt. The three operators are at their stations and have started their room conveyors reversing. The first man takes every third timber from the mother belt and places it on first one of his room belts and then the other—to the right and left, respectively. The next man takes every other timber and does likewise. The spacing between his timbers on the mother belt is no different than for the first man. The third man takes off the remaining timbers which is every third of the original and consequently has the same spacing. In this way, there is no time lost in transferring supplies.

Other supplies, including capboards, rock dust, pipe, brattice cloth and brattice timber, and boxes of tamping clay are handled in the same manner as timbers. Conveyor cradles and belt for 18-in. conveyors are stored along the mother conveyor behind the timber line and outby the working rooms. A service man loads needed items onto the mother belt and the room conveyor operator makes the transfer into the proper room.

The belts run continuously and the supplies go in a steady stream from the mine cars to the room faces where the crew unloads them. The total time for handling supplies from the loading point to face depends on the location of the last room and its depth; when this room is at the tail piece of the mother belt, the time is approximately 47 minutes. This time is composed of 35 minutes to place all supplies on belt and 12 minutes for the last item to travel from loading point to room face. Since approximately 30 minutes are required at the faces to get ready to run coal, this can be deducted from time for handling supplies.

The handling of supplies on one of our room headings was observed on the second day the mines operated after a recent shutdown. This heading was one of such length that a second mother conveyor worked in tandem. The transfer was between

Nos. 20 and 21 rooms; at the time of observation No. 21 was inby and No. 20 was outby the transfer point.

The mine car mantrip arrived from the outside at 7:15 am and men immediately loaded onto the belt. Approximately 10 minutes later, the loading of supplies began. The first items were bags of rock dust; next came 275 timbers and sufficient capboards. When half of the timbers had been loaded, the observer rode the belt to No. 20 room and saw the supplies transferred into No. 20 room (right and left) and onto the tandem 30-in. conveyor for No. 21 room. He stayed there until the last supplies were delivered to the No. 21 room when the belts were stopped and the direction changed to forward. He got on the belt to come outside and when he got to the No 19 room, coal was coming from the room to the mother belt and the operator had to shut down the 18-in. belts until the observer passed that point. Coal was delivered onto the mother belt at 8 am, just 45 minutes from the time the men left the loading point.

Correct Installation Makes Reversing Possible

We have found that when conveyors are properly aligned for forward movement, they do not get out of line on reversing enough to injure the belt. Mother belts and room belts are set to a true line with spads. These spads are spaced at 25-ft intervals for aligning mother belts. A minimum clearance of 24 in. is maintained from belt to roof. A profile of the heading is furnished and some blocking of conveyor and some grading of bottom is done to eliminate excessive changes in grade as a minimum vertical curve of 250-ft radius is observed. The conveyor is leveled at right angles to the belt center line. Belt splices are carefully squared with a template. When the conveyor is set up in this manner, the belt holds contact with all rolls and when idlers are properly aligned for forward movement of belt, no trouble is experienced in reversing. No aligning idlers are used.

POWER READINGS ON BELT CONVEYORS

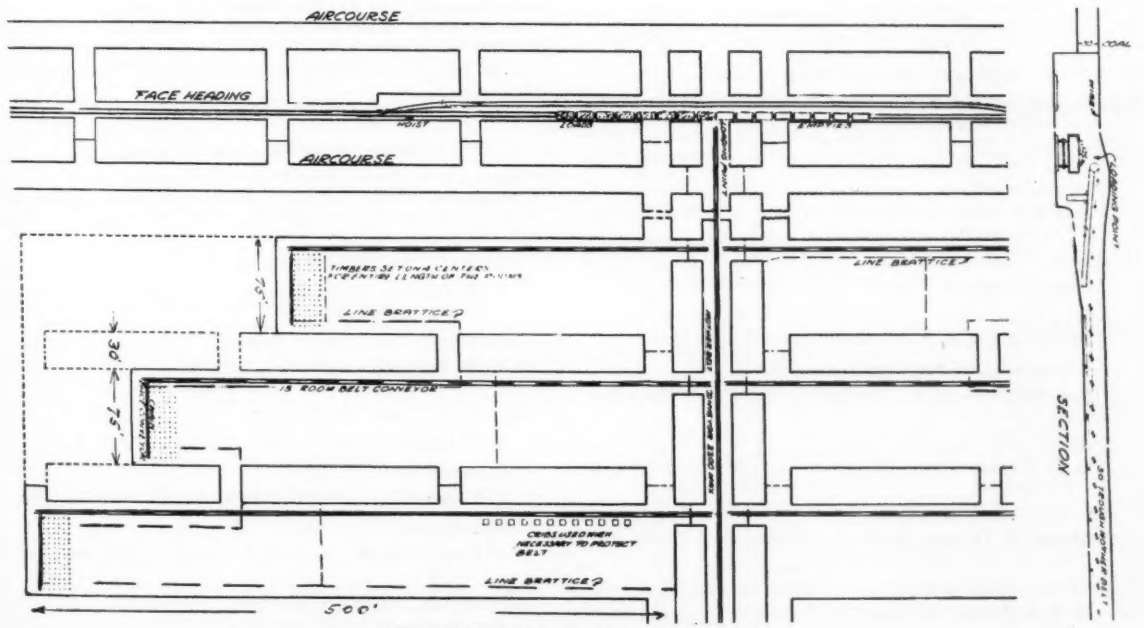
All Conveyors Running Empty

	Test No. 1	*Test No. 2*	*Test No. 3*	*Test No. 4*
Location	No. 4 Butt	No. 1 Butt	21 Room Rt	21 Room Lt
Belt width	30 in.	30 in.	18 in.	18 in.
Belt length	2098 ft	2084 ft	382 ft	394 ft
Vertical distance	+18.8 ft	—26.5 ft	+21.6 ft	+1.3 ft
No. splices	5	5	9	11
Motor	25 hp	25 hp	10 hp	10 hp
Speed ratio	9.1 to 1	10 to 1	10 to 1	10 to 1
Belt speed	250 fpm	250 fpm	250 fpm	250 fpm
Power readings:				
Running forward	270 v	280 v	270 v	270 v
Running forward	50 amp	40 amp	28 amp	25 amp
Running forward	18 hp	15 hp	10 hp	9 hp
Running reverse	270 v	280 v	270 v	270 v
Running reverse	50 amp	40 amp	31 amp	25 amp
Running reverse	18 hp	18 hp	11 hp	9 hp

Power Tests

Sample profiles of two mother belt installations and two room belt installations accompany this report. These four conveyors have been observed in operation and pertinent data obtained. Power readings were obtained on each, running forward and in reverse, traveling empty. The accompanying tabulation shows the power data, and in addition to the figures given, it might be well to state that in the two 30-in. conveyors (Tests 1 and 2) each has a dust-proof starter, manual reversing, No. 2 stranded wire, four conductor, all rubber insulation. The two room conveyors (Tests 3 and 4) each have explosion-proof starters, manual reversing, No. 6 wire, four conductor, all rubber insulation. There are emergency switches at the mouth of each room to stop the 30-in. conveyor.

In general, the tests show that there is no difference in power consumption for an empty belt traveling forward and in reverse. Power readings will be made on the conveyors loaded, at a later date, and this should show a difference when the conveyor is reversed, because of the grade. When the forward direction is down grade, the power consumption should be less for forward movement of belt, and when the forward direction is up grade the reversed conveyor should require less power than when running forward.

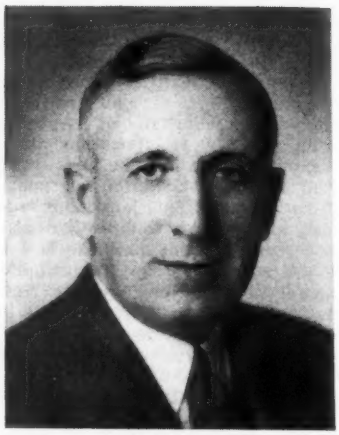


Plan of low vein conveyor mining system

Plans Set for 1950 Coal Convention

PLANS for the 1950 Coal Convention to be held at the Netherland Plaza Hotel, Cincinnati, April 24-26 are practically completed. An active committee including representatives of all branches of coal mining has been hard at work under the direction of E. R. Price, national chairman of this year's convention. A series of eleven sessions has been arranged for the three-day meeting to present a comprehensive story of coal's progress, including operating problems of deep and strip mining, bituminous coal and anthracite, as well as general economic problems of wide interest to all those engaged in this basic industry.

Of special interest are the two general topics—public relations and educational training—to be presented on Monday morning, April 24. Symposiums or panel discussions will bring forth full measures of information on safety, roof bolting, continuous mining, and coal preparation. The program is presented in detail herewith.



E. R. Price
Inland Steel Co.
National Chairman

Advance Program

MONDAY—APRIL 24

9:45 am—Opening Session

Improved Public Relations—The value to the coal industry that can result through the efforts of individual companies—How a better understanding of coal's problems can be developed in local communities, fields and markets.

A. C. Spurr, President, Monongahela Power Co.

Educational Programs to Develop Supervision—A panel discussion to bring out what is being done and what can be done through a cooperation between schools, colleges and coal companies toward training high school and engineering graduates for supervisory positions in coal mining.

H. C. Livingston, Vice-President, Union Pacific Coal Co.

H. L. Walker, Head, Department of Mining and Metallurgical Engineering, University of Illinois.

G. R. Spindler, Director, School of Mines, West Virginia University.

12:15 pm—Luncheon

Speaker to be Announced

2:30 pm—Deep Mining Session

A Symposium on Mine Roof Bolting—Covering all phases of this new development which is already leading to changes in operating practices, and will undoubtedly have a marked effect on improving the safety and efficiency of future coal mining.

Principles and Theory:

Prof. P. B. Bucky, Executive Officer, School of Mines, Columbia University.

Roof Bolting in Thin Seams:

Henry S. Jamison, Engineer, Delmont-Peerless Coal Co.

Use of Wood Pins:

Sterling S. Lanier, Jr., President, Norton Coal Corp.

Applications in Steeply Pitching Measures:

D. E. Ingersoll, Division Superintendent, Philadelphia & Reading Coal & Iron Co.

Successful Practices in Alabama:

E. H. Stevens, Project Engineer, Tennessee Coal, Iron & Railroad Co.

Accidents in Roof Bolting:

Edward M. Thomas, Engineer in Charge, Roof Control Section, U. S. Bureau of Mines.

Mechanical Equipment to Serve Various Conditions:

Dr. T. H. Troller, Vice-President, Engineering, Joy Manufacturing Co.

2:30 pm—Strip Mining Session

Power Requirements for Strip Mines—Advantages of cable distribution systems over the conventional overhead type—Peak kilowatt, maximum demand, load factor and power factor requirements.

Maurice L. Quinn, Chief Electrical Engineer, Sinclair Coal Co.

Grounding 440 Volt Circuits—Results of an investigation to determine a safe and practical system of grounding now being installed by several strip mines—Possible faults of the Derived Neutral System discussed in detail.

L. E. Briscoe, Electrical Engineer, Ayrshire Collieries Corp.

Seismic Effects of Overburden Shooting—Observations and studies analyzing the directional forces occurring in overburden shooting—How damage to structures at various distances is roughly predictable.

Dr. L. Don Leet, Harvard University Seismograph Station, Oak Ridge Observatory.

Radio Communication in Strip Mines—Describing an actual installation and discussing the operating advantages of constant communication between all the units in a modern strip pit.

L. W. Barco, Assistant Superintendent, United Electric Coal Cos.

TUESDAY—APRIL 25

9:30 am—Coal Preparation Session

A Symposium on Drying Fine Coal—The complete range of mechanical and thermal methods—Dewatering screens, centrifuges, filters, rotary kilns, flash dryers—Water clarification—Sludge reclaiming to recover fuel values.

Methods in Central Pennsylvania:

F. P. Calhoun, Assistant Production Manager, Rochester & Pittsburgh Coal Co.

Mechanical Drying in West Kentucky:

F. R. Buckley, Construction Engineer, and **George Land,** Director of Research, West Kentucky Coal Co.

Centrifugal Dryers and Filters:

L. O. Lougee, Mining Engineer, George S. Baton & Co.

Dewatering and Heat Drying:

F. C. Menk, Director of Engineering, Island Creek Coal Co.

Anthracite Methods:

William T. Turrall, Preparation Engineer, Lehigh Navigation Coal Co.

Recovery and Desliming Fine Coal:

R. L. Sutherland, Combustion Engineer, Truax-Traer Coal Co.

9:30 am—Mine Safety Session

Methods to Reduce Mine Accidents—A panel discussion between representatives of all branches of coal mining—Men from federal, state and coal company safety departments, give combined viewpoint and best thought of industry. Review of what has been accomplished and what further steps can be taken to prevent accidents.

J. J. Forbes, Chief, Health & Safety Branch, U. S. Bureau of Mines.

R. J. Howell, Safety Engineer, Glen Alden Coal Co.

A. D. Sisk, Chief, Kentucky Department of Mines and Minerals.

C. R. Stahl, Assistant to Vice- President, Eastern Gas & Fuel Associates.

Ralph Whitman, Superintendent, Ingle Coal Co.

12:15 pm—Luncheon

Address: "The Biggest Threat to American Business"

Louis B. Seltzer, Editor, The Cleveland Press

2:30 pm—Deep Mining Session

Power Controls for Belt Conveyors—Coordinating the various units in a belt conveyor system, to give a regular and continuous flow of coal—equipment and practices for sequence starting, slippage protection, spillage prevention, speed control and emergency stops.

George T. Atkins, Electrical Engineer, Barnes & Tucker Co.

W. F. Roberts, Electrical Engineer, Jeffrey Manufacturing Co.

The Use of AC Power Underground—Comparing the Characteristics of AC and DC operation—Advantages and disadvantages of Each—Recommendations and suggestions for extending the use of AC in modern mechanized coal mining.

J. O. Cree, Electrical Engineer, West Virginia Engineering Co.,

David Stoetzel, Mining Division, General Electric Co.

Modern Mine Haulage With Belts—Describing an installation in northern West Virginia which has recently gone into operation—Single belt, 2 miles long, transports coal from the cleaning plant to river and rail loading.

C. W. Thompson, Assistant Manager, Weirton Coal Co.

Modern Underground Track Haulage—A summary of physical and operating conditions that led to the construction of a 4½-mile track tunnel—Signal systems control trip movements and maintain a steady flow of coal from the mine to the new Price cleaning plant.

G. F. Leatherman, Superintendent, Power and Mechanical Department, Inland Steel Co.

2:30 pm—Deep Mining Session

Results of Time Studies to Improve Operating Efficiency—A presentation by three speakers showing how performance records and costs have been improved, and production delays eliminated through the intelligent application of time studies to three of the major phases of mine operation.

Face Preparatory:

John K. Berry, Engineer, Consolidation Coal Co. (Ky.)

Mechanical Loading:

Paul R. Paulick, Consulting Mining Engineer, Library, Pa.

Service Haulage:

Prof. A. W. Asman, Chief, Division of Mining, Pennsylvania State College.

Maintenance of Mining Equipment—Organization of the maintenance and repair crews—Classes of work done in the mining panels, underground shops and surface shops—Lubrication in all of its phases of handling, distribution and application at the machines.

George L. Judy, Assistant Maintenance Superintendent, Consolidation Coal Co. (Ky.).

2:30 pm—Strip Mining Session

Use of Voltages Higher Than 4,000 for Large Equipment—Operation of heavy equipment for overburden removal and coal loading in strip pits, is calling for more power—A higher efficiency, together with lower costs are had through the use of high voltages.

J. E. Borland, Mining Division, Westinghouse Electric Corp.

Wheel Excavator for Overburden Removal—Greater depths of overburden in modern coal stripping are requiring the use of auxiliary equipment to supplement the conventional types—The wheel excavator is entering the field for this type of service.

J. J. Huey, Chief Electrical Engineer, United Electric Coal Cos.

Measurable Advantages of Outside Curves—A method to determine the gains from using outside curves of various radii in overcasting—illustrated by charts, sections and layouts.

Lale Stewart, Engineer, Maumee Collieries Corp.

R. M. Dickey, Sales Representative, Bucyrus-Erie Co.

WEDNESDAY—APRIL 26

9:30 am—Pension Plans Session

Informing Employes Concerning the Problems of Pensions—How much do employes and the public know about the cost of pensions? Who pays the cost? Is it management's responsibility to provide information to workers and communities on subjects as technical and difficult as these? If so, when and how?

Roscoe C. Edlund, Plans Board Chairman, Fred Rudge, Inc.

A Future Pattern for Voluntary Pension Plans—Desirable principles to be considered in developing voluntary pension plans—Recent pension settlements point to the need for a more satisfactory pattern for voluntary plans—Some suggestions for employer, employe and government consideration.

J. W. Myers, Manager, Insurance and Social Security Dept., Standard Oil Co. (N. J.).

Essentials of a Sound Pension Plan for Company Employes—A discussion based on a wide background of legislative and judicial experience.

Judge Charles I. Dawson, Louisville, Ky.

9:30 am—Coal Preparation Session

European Trends in Coal Cleaning—An outline of preparation processes used abroad to meet severe cleaning problems—Observations made in a recent trip through the European coal fields.

John Griffen, Consulting Engineer, McNally-Pittsburg Manufacturing Corp.

Latest Developments and Trends in Coal Preparation—A review of improvements in present methods and a discussion of new processes designed to prepare coal of a quality that will hold its market against competitive fuels.

A. C. Richardson, Concentration Engineer, Battelle Memorial Institute.

Preventing and Extinguishing Fires in Surface Refuse Banks—A presentation in two parts covering the Anthracite and Bituminous fields—Practices in surface storage of mine refuse and washery rejects—An analysis of the causes of firing in waste piles and examples of preventive and extinguishing methods.

Henry F. Hebley, Research Engineer, Pittsburgh Consolidation Coal Co.

E. T. Powell, Chief Engineer, Susquehanna Collieries Division, The M. A. Hanna Co.

2:00 pm—Deep Mining Session

A Symposium on Continuous Mining—Describing operations with different types of machines—Discussing how the conventional practices in service haulage, power, ventilation, etc., must be devised to meet the requirements for a continuous operation.

Present Status and Future Possibilities:

Gerald von Stroh, Director, Mining Development Committee, Bituminous Coal Research, Inc.

Operating with the Continuous Miner:

William E. Hess, General Superintendent, Vesta-Shannopin Coal Division, Jones & Laughlin Steel Corp.

Operating with the Colmol:

W. J. Phillips, Assistant to President, Sunnyhill Coal Co.

Service Haulage with Different Types of Equipment:

M. F. Cunningham, Sales Manager, Goodman Mfg. Co.

Power for a Continuous Mining Unit:

R. M. Hunter, Electrical Engineer, Rochester & Pittsburgh Coal Co.

C. E. Hugus, Jr., Supervisor of Mining Applications, Reliance Electric & Engineering Co.

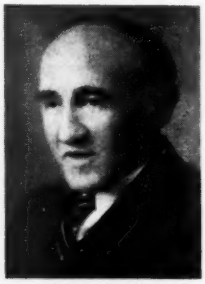
Ventilation Problems in the Working Panels:

A report by the Coal Division Committee on Mine Ventilation.

Members—Program Committee

C. B. Baton
George S. Baton & Co.

P. W. Bigley
Centrifugal & Mechanical Industries, Inc.



Charles S. Blair
Black Diamond Coal Mng. Co.

L. C. Campbell
Eastern Gas & Fuel Associates

John L. Clarkson
Clarkson Mfg. Co.

Harrison Eiteljorg
Morgan Mines, Inc.

Evan Evans
LehighNavigation Coal Co.

John R. Foster
Chicago, Wilmington & Franklin Coal Co.

J. H. Fulford
Jeffrey Mfg. Co.

J. A. Gilruth
Gould Storage Battery Corp.

William E. Goodman
Goodman Mfg. Co.

John Graham
American Steel & Wire Co.

Carl T. Hayden
Sahara Coal Co.

G. R. Higinbotham
Consolidation Coal Co. (W. Va.)

C. E. Hough
Imperial Smokeless Coal Co.

James Hyslop
Hanna Coal Co.

G. S. Jenkins
Consolidated Coal Co.

C. E. Jones
Caterpillar Tractor Co.

Merle C. Kelce
Sinclair Coal Co.

A. S. Knoizen
Joy Mfg. Co.

Special activities include a Monday luncheon presided over by S. M. Cassidy, president, Consolidation Coal Co. (Ky.) and Chairman of the Coal Division and a Tuesday luncheon presided over by M. L. McCormack, manager, Rock Drill Department, Ingersoll-Rand Co. and Chairman of the Manufacturers Division.

Arrangements have been made for a "Mining Congress" section at the night baseball game between the Cincinnati Reds and the St. Louis Cardinals on Monday, April 24. Applications for tickets should be sent, together with check or money order, direct to the Cincinnati Baseball Club Co., 307 Vine St., Cincinnati. Box seats are $2.00 each and other grandstand seats are $1.75 each.

Coal miners and their ladies will enjoy exceptional entertainment on Tuesday evening at the Coal Miners' party. Climaxing the three busy days of the convention is the annual banquet on Wednesday evening. This top social function of the coal mining industry will feature a fine dinner and brief introducions of honored guests

(*Continued on page 69*)

(*Photos not available*)

M. H. Forester
Pittsburgh Consolidation Coal Co.

E. F. Maurer
Rail & River Coal Co.

M. W. Pennybacker
I-T-E Circuit Breaker Co.

C. J. Perry, Jr.
E. I. du Pont de Nemours and Co.

O. B. Pryor
Kelley's Creek Colliery Co.

George A. Roos
Philadelphia & Reading Coal & Iron Co.

W. S. Webster
Walter Bledsoe & Co.

K. L. Konnerth
H. C. Frick Coke Co.

Robert W. Lahr
Enterprise Wheel & Car Co.

H. B. Lee
Maumee Collieries Co.

H. C. Livingston
Union Pacific Coal Co.

Gordon MacVean
National Mine Service Co., Inc.

A. R. Matthews
Clinchfield Coal Corp.

H. E. Mauck
Olga Coal Co.

J. F. Mazza
Rochester & Pittsburgh Coal Co.

L. O. Millard
Link-Belt Co.

Thomas Murphy
Northwestern Improvement Co.

Davis Read
West Kentucky Coal Co.

G. M. Rigg
Weirton Coal Co.

C. B. Stainback
Westinghouse Electric Corp.

E. F. Stevens
Pyramid Coal Corp.

G. J. Stollings
Powellton Coal Co.

C. W. Waterman, Jr.
McNally-Pittsburg Mfg. Corp.

Paul Weir
Paul Weir Co.

Wheels of GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

THE second session of the 81st Congress has entered its third month in high gear, driving ahead with committee hearings on appropriations, curbing of labor monopolies, international relations, tax revisions, social security and atomic controls.

For the present at least, the chief concern centers in the bituminous coal strike, and in the current failure of procedures thus far invoked to put the men back in the mines.

Tax Hearings

As the House Committee on Ways and Means closed its hearings early this month, speculation was intense on the action the Committee will take on the Treasury's percentage depletion recommendations. Treasury Secretary John Snyder's suggestions of February 3 called for reduction of the rates on oil and gas and on sulphur to 15 percent and reduction of the present 15 percent rate on nonmetallics to 5 percent. He suggested that the present rate of 15 percent on metal mines remain unchanged, and proposed no change in the present 5 percent rate for coal mines.

American Mining Congress witnesses testifying before the Ways and Means Committee February 9 were led by Donald A. Callahan, vice-president of the Congress, from Wallace, Idaho. Other witnesses included Horace M. Albright, president, U. S. Potash Co. and chairman of the National Minerals Advisory Council; chairman Henry B. Fernald of the AMC Tax Committee; Charles F. Willis, secretary, Arizona Small Mine Operators Association; Rolla D. Campbell, general counsel, Island Creek Coal Co.; Kenneth B. Ray, Food Machinery and Chemical Corp., Green River, Wyo.; Fred O. Davis, U. S. Potash Co., Carlsbad, N. M.; Langbourne Williams, president, Freeport Sulphur Co.; S. W. Tuttle, vice-president, International Talc Co.; Carl J. Trauerman, Mining Association of Montana; and John Bishop, Universal Zonolite Co.

Mr. Callahan gave the Committee a thorough justification of the depletion allowance and deplored the continued Treasury attacks in the face of past exhaustive Congressional study and support of the mining industry's position.

He then called upon Congress to improve the revenue laws to create a tax climate which will provide an incentive to continued mining investment and operations. Mr. Callahan asked: (1) extension of depletion allowances to the stockholders of mining corporations; (2) a three to five-year tax-free period for new mining ventures; (3) recognition of development costs as operating expenses, to be deducted from income either in the year in which the expenditures are made or in subsequent years as the ore is mined; (4) losses from unprofitable mining ventures to be allowed as ordinary deductions against current income; (5) increase the percentages used in computing depletion, with respect to both gross income and net income; and (6) losses of loss years to be fully deductible in determining income of years of income with the same effect as if the income year and the loss year constituted a single taxable period.

The above changes in the revenue law had likewise been recommended by the National Minerals Advisory Council to the Department of Interior and the Council's chairman, Horace M. Albright, also placed these recommendations before the Ways and Means Committee, urging their adoption.

Bituminous Council Recommendations

In the course of Rolla D. Campbell's presentation on taxation of coal mines, Representative Simpson of Pennsylvania, a Ways and Means Committee member, placed in the record the report of the Taxation Committee to the National Bituminous Coal Advisory Council. Simpson had requested this report of Heath S. Clark, chairman of the Council's Taxation Committee.

This report recommends the following changes in the Federal income tax structure as in the Nation's interest, as well as in justice to the bituminous coal industry: (1) that percentage depletion allowances for the bituminous coal industry be fixed at 15 percent of gross income, limited to 75 percent of net income; (2) that, in the case of bituminous coal mines, all expenditures for exploration and development (other than expenditures for depreciable property) in excess of net receipts from coal sold during the exploration and development stage shall not be added to capital account recoverable through depletion but shall be deductible as expenses or cost of operation, at the option of the taxpayer, either (a) in the year in which paid or incurred, or (b) as deferred expenses ratably apportioned to the production, or (c) as a loss in the year in which there is no reasonable expectation of further production from the property; (3) that the bases of depreciable or depletable assets of bituminous coal mines be not decreased if the depreciation or depletion allowable can not be applied against taxable income;

Washington Highlights

CONGRESS: Driving ahead.

TAX HEARINGS: Depletion justified.

BITUMINOUS COUNCIL: For tax improvement.

SOCIAL SECURITY: Mining testimony March 9.

LABOR MONOPOLY: Robertson bill would curb.

COAL STRIKE: Mishandled by Federal agencies.

MINE-MILL UNION: CIO expels.

DELIVERED PRICING: Enactment likely.

(4) that Section 102 of the Internal Revenue Code be amended so that the Commissioner of Internal Revenue shall have the burden of proving that profits have been unreasonably accumulated, along with the other amendments above suggested; (5) that, in the case of bituminous coal mines, net operating losses be carried back for two years and carried forward for five years; (6) that accelerated depreciation be allowed on a five-year basis at the option of the taxpayer, on all depreciable assets acquired by bituminous coal companies after beginning of fiscal years ending in 1949; and (7) that the tax on intercorporate dividends and the two percent penalty on consolidated returns be removed from the Code.

Social Security

March 9 has now been set by the Senate Committee on Finance for receiving the testimony of mining witnesses on the independent contractor phase ("block-leasers") of the pending Social Security bill, H. R. 6000. Under current law these independent contractors are excluded from the definition of "employe."

The Finance Committee has scheduled a number of independent contractors from California, Utah, and Colorado, who will explain in their testimony why they do not wish to be classified as employes under the pending bill. Management witnesses who will testify March 9 are Robert M. Searls, mining attorney of San Francisco; H. R. Fitzpatrick, manager, Empire Star Mines Co., Ltd.; Merrill E. Shoup, president, Golden Cycle Corp.; Thomas M. Burgess, attorney of Colorado Springs, Colo.; James K. Richardson, manager, Utah Mining Association; and T. P. Billings, consulting mining engineer, U. S. Smelting Refining and Mining Co.

Labor Monopoly

Hearings have continued intermittently since February 16 on Senator A. Willis Robertson's (Dem., Va.) bill, S. 2912, discussed in the February JOURNAL. Consideration is being given the measure by a Senate Judiciary subcommittee headed by Senator Eastland (Dem., Miss.) and including Senators O'Conor (Dem., Md.) and Donnell (Rep., Mo.).

Lawyers and witnesses from numerous associations warned that if the existing monopolistic control by a labor union continues over coal mining it will spread to other industries. AFL and CIO witnesses registered vigorous opposition to the Robertson bill, claiming that it would "add to the mischievous effect of Government by injunction."

The American Mining Congress urged that the prohibitions of the antitrust laws again be made applicable to unions, and made available to the Committee the Congress' Declaration of Policy adopted at San Francisco and later approved by the Board of Directors.

Coal Strike

As of this writing the UMWA bituminous coal mines of the country are still idle. On March 2 Federal Judge Keech ruled that the United Mine Workers were not guilty of civil and criminal contempt charges brought by the Government following failure of the coal miners to return to work under an order of the court. Congress immediately discussed quick enactment of legislation authorizing the President to seize the mines.

Previously the Board of Inquiry appointed by the President under provisions of the Taft-Hartley Act had held hearings Feb. 8 and 9, and reported to the President Feb. 11, whereupon Mr. Truman directed the Attorney General to seek court intervention. Judge Keech immediately filed a temporary restraining order, pending hearings on the Government's motion for a preliminary injunction. Stating he had "no other alternative," John L. Lewis called upon the coal miners to return to work. They failed to do so, and it was reported that "goon squads" stopped production on the part of those who attempted to return.

In declaring the UMWA "not guilty" in his March 2 ruling, Judge Keech concluded that the Government had failed to prove "that the Union has knowingly, wilfully, wrongfully and deliberately disobeyed and violated the temporary restraining order . . . the facts disclosed by the record in this case do not prove—either beyond a reasonable doubt or by clear and convincing evidence—that there has been wilful contempt of this court's order on the part of the union, by the action which it has taken or by the action which it has failed to take."

Emphatic in his criticism of the Justice Department's handling of the case, Senator Taft of Ohio called for a Senate investigation. He charged that the Government had deliberately prepared a weak case. Taft declared that the Justice Department had been furnished with 60 affidavits signed by persons present when local union officials told the miners that the telegrams from John L. Lewis, instructing them to return to work, could be ignored. He called for the filing of new contempt charges against the union on the basis of these affidavits.

Mine-Mill Union Expelled

The un-American conduct of the International Union of Mine, Mill and Smelter Workers was severely rebuked and checked in mid-February by expulsion of that Communist-dominated labor organization from the CIO. The

(*Continued on page* 66)

Who Loses a Strike? By Reg Manning

Salt Lake Tribune

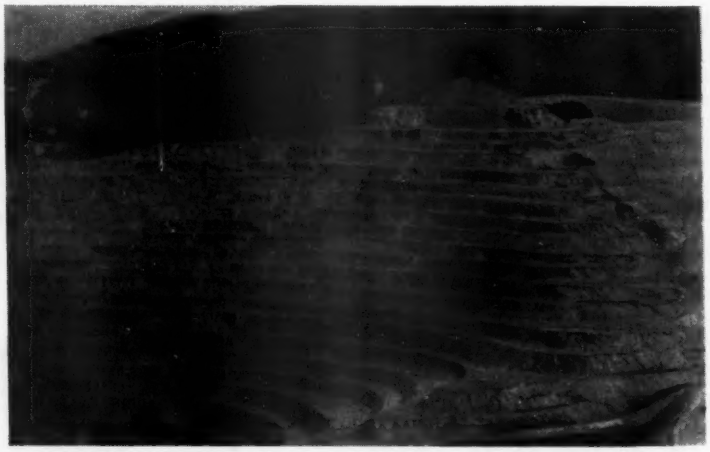
1950 Metal Mining Convention And Exposition Starts to Roll

Arrangements Committees Formed to Organize Special Features of Program

SUGGESTIONS for topics to be presented at the 1950 Metal Mining Convention and Exposition in Salt Lake City, August 28-31, have already started to roll in for consideration by the Program Committee. This important Committee, charged with the actual responsibility of selecting the topics of greatest interest and value to operating men, will convene in May to tackle the task of designing a program of top-notch interest.

A development of special interest to milling men is the completion of arrangements requested by the Minerals Beneficiation Division of the American Institute of Mining and Metallurgical Engineers, under which the members of that Division will hold their mid-year meeting in Salt Lake City on Friday, September 1, immediately following the Mining Congress Convention and Exposition. The AMC program itself will include two sessions on practical milling problems, and two further excellent sessions on milling technique will be held by the Minerals Beneficiation Division.

General arrangements for the Salt



Convention visitors will have an opportunity to visit Bingham Canyon

Lake City Convention are already under way. The men and women whose photographs are shown here are key figures in concluding the details of the meeting, entertainment, trips, housing, publicity and reception of Convention visitors when they gather at the Salt Lake City Fair Grounds in August.

Registration for this gathering of metal and nonmetallic mining men will be speeded up by the streamlined method used at the 1949 Convention in Spokane. Registration forms will be distributed throughout the industry—to both operators and manufacturers—well in advance, requesting lists of those who will attend. Hand-lettered badges will be made up and forwarded to registrants, thereby eliminating any delays in going through this formality at Salt Lake City.

Room reservations are being handled by Mrs. Winifred P. Ralls, Convention Bureau, Chamber of Commerce, Box 329, Salt Lake City. Placing reservations now will help you to secure the type of accommodations you desire. Salt Lake City will be a hub of activity during the week of August 28. Be there and participate in a convention devoted to the consideration of broad industry problems, and see the exposition of machinery that will help you attain the objective of increased efficiency.

Arrangements Committees

D. D. Moffat
General Chairman

James K. Richardson
Vice-Chairman

R. D. Bradford
Chairman
General Arrangements Committee

Paul H. Hunt
Chairman

A. G. MacKenzie
Vice-Chairman

Trips Committee

Louis Buchman
Chairman

E. W. Engelmann
Vice-Chairman

Publicity Committee

E. H. Snyder
Chairman

Otto Herres
Vice-Chairman

Exposition Committee

(Photo not available)

Mrs. O. N. Friendly
Chairman

Mrs. L. H. Hart
Vice-Chairman

Ladies Committee

F. A. Wardlaw, Jr.
Chairman

James W. Ware
Vice-Chairman

Reception Committee

Dust Control

(*Continued from page* 47)

was more important in experimental installations to prove the practicability of the method and to leave dust control a secondary consideration rather than to insist upon adequate dust control and possibly impair the interest in making experimental installations. However, early in 1949 when roof-bolting became popular, and our field men gained enough experience so that they could forecast the approximate results after examining proposed places of installation, it was difficult to convince these new users that dust-control measures should be adopted at their particular mines, especially when some of those who had made the original experimental installations had not considered provisions for dust control.

"The standard, effective method of dust control with pneumatic percussion drilling for many years has been to force water under pressure through hollow drill steel to the bit, and over the years the method has been enforced so rigidly in rock work in metal mines—that it has been taken as a matter of course even though the drilling of vertical or near vertical holes is a sloppy, disagreeable task.

"The coal miner, however, is an individualist, and regardless of any explanation that such wet-drilling is standard practice in metal mines, he is unimpressed and wants no part of such a disagreeable task. It is difficult for him to visualize the silicosis hazard or take it very seriously; therefore, he may be inclined to gamble with his future health for the sake of his immediate comfort. He does not offer serious objections to using a respirator when his boss is near by, but is inclined to discard it when not under direct supervision; however, if he wore a respirator continuously, others working 'down-wind' from him may have no similar protection.

"Experimental installations are made in a few bituminous coal mines using pneumatic percussion drills operated wet; no labor trouble of operating difficulties arose. At one large mine, however, an experimental installation was started with dry drilling; later, after the method proved to be effective, both labor and operating difficulties occurred and several months elapsed before the rate of drilling wet equaled that when drilling dry.

"Attempts have been made to use high-speed rotary coal drills, designed for horizontal drilling, in vertical drilling for roof bolting, but water could not be applied at the bit to control the dust. The design of such a drill makes it virtually impossible to prevent the stream of water falling from the hole from entering the drill-motor casing.

"Some company representatives and others are studying the possibilities of (1) developing a dust collector to collect dry dust as it is produced at the collar of the drill hole as effectively as dust can be controlled with wet-percussion drilling; or (2) using a foaming agent to reduce the amount of water ordinarily required in wet drilling to collect the drill cuttings at the bit."

Conclusion

Following the prepared statements, the meeting was then thrown open for discussion. It was generally agreed that roof bolting in coal mines is still in the pioneer stage, but that it is not beyond the capacity of American industry to meet successfully any of the problems involved. The chief obstacle to large-scale production of roof-bolting machinery is the lack of a clear conception of the requirements of mine operators. Standardization of requirements is the most urgent need at the present time if manufacturers are to meet successfully and quickly the need of the coal mining industry.

Mobile Utility Station

(*Continued from page* 39)

ft in length and 3 ft in diameter. Both the air receiver and the water tank are designed for a 150-psi safe working pressure. Each has a manhole and drain plugs or blow-off valves to permit periodic cleaning.

A piping diagram of the unit shows how the receiver is connected to the compressors with 6-in. pipe and to the top of the water tank with 2-in. pipe. The water is thus under the same pressure as the air in the receiver. One 4-in. air outlet and one 2-in. water outlet are provided at each end of the station. Several additional water and air outlets are provided at convenient locations on the station.

Each compressor is guarded by a 2-in. safety valve, and the air receiver and water tank are guarded by 3-in. safety valves set for 125 psi.

Immediately after the mobile utility station was placed in operation, temperature readings were taken at various points in the compressed-air system. The mine air had a temperature of 40 F when the readings were taken. Readings taken at the 4-in. gate valve where the tunnel hose to the multiple-drill carriage was connected showed that the temperature of the compressed air was 100 F with the compressors idling and a maximum of 170 F when all the drills on the multiple-drill carriage were operating. The 4-in. tunnel hose has a temperature resistance of 275 F, so there is a large safety factor in this respect. The temperature of the compressed air at the intake to the drills reached 100 F within a few minutes of operation and attained a maximum of 105 F at the end of the drilling shift. The temperature difference between the air entering the compressors and the compressed air entering the drills was, therefore, about 60 F. This difference in temperature corresponds to a 12 percent increase in the effective capacity of the compressed-air system over the rated capacity of the compressors. Because they are operated close enough to the drills so that the heat energy in the compressed air is not completely dissipated in long pipe lines, the mobile compressors have an effective capacity equivalent to a 1725 cfm stationary compressor.

Placing the unit in operation is simple. It is towed into place with a tractor, leveled up with two jacks on the low side if necessary, the trail cable is plugged into a receptacle, the power is switched on, and the compressors are ready to operate.

The mobile utility station has been in operation for over six months and has proven satisfactory. No difficulties have been encountered in operating the unit; and its performance, in some respects, is better than had been anticipated. A portable unit of this type has several advantages which cannot be obtained through the use of stationary compressors and connecting pipe lines. Some of these advantages are as follows:

(1) An adequate air supply at constant pressure is assured.

(2) The cost of installing and maintaining air and water lines is eliminated.

(3) The problem of having to tear out and replace air and water lines as mining progresses on different levels is also eliminated.

(4) Losses in efficiency of the compressed-air system due to leaks and friction in pipe lines are minimized.

(5) The effective capacity of the compressors is increased by about 12 percent because the compressed air is used before all of its heat energy is dissipated.

BOOK REVIEW

THE COEUR D'ALENE MINING DISTRICT. 1948. *Scamahorn Air Photo Co., Spokane. $5.00 Fifty-one photographs.*

A pictorial study of one of our most important mining districts. Included in the series of excellent aerial shots are scenes of many well known mines of the Coeur d'Alene District including Bunker Hill & Sullivan, Sunshine, Page, Sidney, Highland Surprise, Morning, Hercules, Hecla, Silver Summit, Polaris, Silver Dollar, Dayrock and a host of others.

AMC Personals

B. L. Johnson, former Kennecott Copper official has been named vice-president in charge of operations at Caquipec, Guatemala, for Cia. Minera de Guatemala, an American-financed enterprise. He will relieve **L. K. Requa,** in charge of operations since the inception of the lead-silver-zinc mining operation.

Cadwallader Evans, Jr., recently resigned as president of the Hudson Coal Co., and has announced the opening of an office for consulting work, specializing in the mining and preparation of anthracite. He will continue to serve as director and consulting engineer for the company.

Cadwallader Evans, Jr.

G. B. Fillmore, former senior vice-president, was elected president and **E. C. Weichel,** formerly general manager, was named vice-president.

Mr. Evans, after a period of service with the predecessor of the Hudson Coal Co. and a three-year period as general manager of International Salt Co. returned to the Hudson Coal Co. in 1925 as general manager. In succession he became vice-president, general manager and then, in 1946, president.

Mr. Fillmore has been with the Hudson Coal Co. since 1919 and has served the company in many capacities. During the war he served on the Solid Fuel Committee.

Robert H. Ridgeway has resigned his position with the U. S. Vanadium Corp. and has rejoined the U. S. Bureau of Mines.

W. D. Hawley, formerly superintendent of the Helen mine of Eastern Gas & Fuel Associates, is now general superintendent of all Raleigh County mines for the company. **Joseph H. Benedict,** resident engineer of the Helen No. 9 and Stotesbury No. 11 mines, will be superintendent of the Helen mines. **Squire R. Barrett,** mining engineer, Eccles mine, has been advanced to the position of resident engineer at Helen No. 9 and Stotesbury No. 11.

Arnold B. Landstrom, Houghton, Mich., who has been mill superintendent for the Isle Royale Copper Co. until the firm ceased mining operations, is now with the research department of the Calumet & Hecla Consolidated Copper Co.

Lynn C. Percival retired December 31 as manager of sales of the Island Creek Coal Sales Co. at Cincinnati, Ohio. He was associated with the company since 1909.

Landon E. Smith of Kellogg, Idaho, has been appointed deputy state mine inspector with jurisdiction over the Coeur d'Alene district and in the Clark Fork area.

A. Finley Harper has been appointed chief, division of safety and inspection, department of industrial relations, for the State of Alabama. Prior to his appointment, Mr. Harper was superintendent of mines for the Consolidated Coal Co. of Birmingham, Ala.

Samuel Ross Beckstead, formerly mine foreman at the U. S. Mine, United States Smelting Refining & Mining Co., was transferred recently to the post of safety engineer. **William S. Perry** has been promoted to the position of stope foreman at the U. S. Mine. **Christian J. Bristol** was promoted to stope foreman at the Lark Section.

J. P. Routh, president, The Pittston Co., has announced that **W. H. Naylor** has been elected vice-president in charge of the sales and distribution through Pittston's sales organizations of all the coals produced by Pittston's mining subsidiaries.

On February 1, **James L. Taylor** was transferred to the central engineering division of International Minerals & Chemical Corp. In his new post, Mr. Taylor will handle construction engineering problems for the corporation. Mr. Taylor has been with the corporation for over ten years, working on various construction jobs including the installation of the potash refinery at Carlsbad and the Peace Valley phosphate flotation plant at Mulberry, Fla. For the past two years he has been chief engineer for the Carlsbad potash mine and refinery.

A. J. Morrison is now manager of the shaft and tunnel department, Dravo Corp.'s contracting division, Pittsburgh, Pa.

John Lamprecht, mining engineer, recently joined the staff of Oliver Iron Mining Co. of Virginia, Minn. **B. C. Erickson** has taken a similar position with Oliver at Hibbing.

Jim Hutton has been named resident engineer for the Moffat Coal Co., Sparta, Ill. He succeeds his father, John Hutton, who died in December.

James McMinn, Heimo Ahola and **Mike Dabovich** were recently promoted to assistant face bosses at Potash Co. of America, Carlsbad, N. M.

George E. Owen, formerly a vice-president of the Imperial Coal Corp., was elected president of the corporation at its annual meeting in January. He succeeds **Charles A. Owen,** who was elected chairman of the board of directors. **Harry B. Bartley,** formerly assistant to the president, was elected a vice-president succeeding Mr. Owens.

J. Wilfred Patterson, is now in New Caledonia examining mining properties for the Pacific Engineering Mining & Trading Co.

Charles W. Stickler has rejoined the staff of the Pennsylvania State College as associate professor of mining and will conduct research on the mechanization problems of the slate industry.

H. C. Crays, Walter T. Gunn, Woods H. Martin, James B. F. Melville and **William B. Porter** were elected directors of the Hegeler Zinc Co. at a recent stockholders' meeting. Other elections were **William B. Porter,** president and general manager; **H. C. Lawrence,** vice-president; and **M. E. Thompson,** secretary-treasurer.

Earl C. Robertson, a vice-president of Pittsburgh Consolidation Coal Co., has resigned.

John C. Kinnear, Jr., has been appointed assistant general manager of Kennecott Copper Corp.'s Nevada Mines Division.

H. A. Hawthorne has been elected president of Pocahontas Fuel Co., Inc., succeeding O. L. Alexander, deceased. **Joseph H. Bowen** has been made chairman of the board; **Paul W. Jenkins**, assistant to the president; and **L. B. Crawford**, secretary.

Felix E. Wormser, vice-president, St. Joseph Lead Co., has been elected president of the Mining and Metallurgical Society of America. He succeeds **Dr. J. C. Kinnear** of Kennecott Copper Corp. Mr. Wormser was formally installed as president at the annual meeting and dinner on the evening of January 17.

James L. Head, resident mining engineer, Anaconda Copper Mining Co., was named to succeed Mr. Wormser as vice-president. **Donald M. Liddell** was reelected secretary-treasurer. Counselors of the Society are: **Paul D. Merica, Wilbur Judson, C. H. Benedict**, and **Worthen Bradley**.

Wilbur H. Peter, controller of the M. A. Hanna Co., has retired after 30 years of service with the company. **James M. Erwin** has been promoted from assistant controller to fill the post left vacant by Mr. Peter.

Frederick F. Kett is retiring after 20 years' association with the Vanadium Corporation of America; the last 12 years as general manager of the mining division. He will continue to serve as mining consultant to the corporation with a temporary address at 75 Crecienta Drive, Sausalito, Calif.

Harold Pridham has been appointed vice-president of the Davis Coal & Coke Co., a subsidiary of the Pittston Co.

The Oliver Iron Mining Co. recently announced personnel changes effective January 1, 1950. In the eastern district **Elmer J. Olson** has been transferred to the Fayal open-pit and underground operations. **Earl M. Holmes**, was promoted to assistant superintendent in charge of the Soudan mine. **Fred D. Hoover, Jr.**, has been promoted to general mining captain at the Fayal mine and **John J. Pouchnik** was promoted to mining captain at Fayal underground operations.

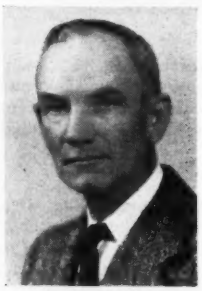
In the Hibbing-Chisholm district **Evald V. Nelson** has been made assistant superintendent of the Morris and Pillsbury mines.

In the Canisteo district **H. F. Bolton** has been made assistant superintendent of the Arcturus and Gross Marble mines. **Robert McIndoo** has been promoted to master mechanic for the Canisteo district.

William E. Weineck, superintendent, Glen Lyon Colliery, Susquehanna Collieries Division, M. A. Hanna Co., retired recently after 53 years of service with Susquehanna and its predecessor companies.

Joseph A. Martino, president, National Lead Co., was recently elected to the board of directors of the Allegheny Ludlum Steel Corp. The two companies have formed the Titanium Metals Corporation of America for the development, sale and distribution of titanium metal, its alloys and allied products.

L. G. Immonen was recently appointed to the post of concentrator superintendent for the Nevada Mines Division of the Kennecott Copper Corp. at McGill, Nev. He succeeds **F. M. Jardine**, who has retired after a long association with the company as superintendent of the 18,000-ton concentrator.



F. M. Jardine

Max Kasten, former assistant chief chemist at the Murray, Utah, plant of the American Smelting and Refining Co., is now chief chemist at the Arkansas Valley smelter.

James M. Vest, assistant to the president, Island Creek Coal Sales Co., has retired after 45 years of active service in the coal mining industry.

E. C. Bradley has announced his retirement from the E. C. Bradley & Sons, mining contractors.

John B. Dorsh, former editor of *Mining World*, is now on the staff of the U. S. Bureau of Mines in Washington, D. C., where he is assigned to the Foreign Minerals Region under the direction of Elmer W. Pehrson.

A. N. Wold, resident engineer, Interstate Iron Co., resigned at the end of 1949 but will continue with the company in a consulting capacity. **H. T. Caddy** succeeds Mr. Wold as resident engineer and **W. A. Benson** has been appointed assistant resident engineer.

The Winding Gulf Association has elected the following officers; **S. A. Caperton**, president; **J. W. Ailstock**, vice-president; **P. C. Graney**, treasurer, and **H. M. Scott**, secretary.

Martin H. Crego, manager of sales of the Phelps Dodge Corp., retired recently after being with the company for a little over 57 years. He started with the company in 1892.

Carl Dann has been named superintendent of the Winters mine, Consolidation Coal Co. (Ky.), succeeding **Robert Collins**.

Wilson T. Lundy has retired as vice-president of Freeport Sulphur Co. He will continue as a member of the board of directors, and his services will be available in a consulting capacity.

—*Obituaries*—

Oakey L. Alexander, 68, president of the Pocahontas Fuel Co., Inc., died on January 21 at New York City. The Pocahontas Fuel Co., Inc. and the Pocahontas Corp., of which Mr. Alexander was also president, operated mines in McDowell and Mercer counties, W. Va., and Tazewell county, Va.

At the time of his death Mr. Alexander was chairman of the board, president and director of the American Enka Corp.; president of the Pocahontas Steamship Corp., Pocahontas Light and Water Co.; director of the New Bedford Towboat Corp., Irvin Trust Co., New York, and the First National Bank of Bluefield, W. Va. He was also president of the Pocahontas Operators Association. He was active in many civic and social organizations and had been a director of the National Coal Association since its organization and was a member of its executive committee.

An outstanding coal operator he was vitally interested in the welfare of the coal industry and served on numerous committees of a national scope.

Lee A. Ginzel, 67, secretary and advertising director of the Baker Manufacturing Co., died in January. He had been associated with the company for 41 years.

John A. O'Neill, 56, research engineer of the Anaconda Copper Mining Co., died in late January. He had been with the company for 32 years. His death came as a great shock to the many engineers who had benefitted by his guidance.

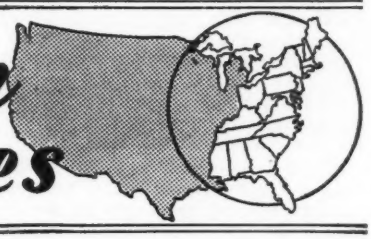
Harold J. Racette, 46, sales representative for Flexible Steel Lacing Co., died late in November.

Delbert B. Savers, 73, chief engineer from 1908-1922 with the Stonega Coke & Coal Co., Big Stone Gap, Va., died December 4. Before he retired in 1946, he was chief engineer for the Upper Arlington Co.

Ralph P. Weidenfeller, 63, died late in January at Coleraine, Minn. He was chief engineer of the western Mesabi range iron mining operations of Oliver Iron Mining Co.

NEWS and VIEWS

Eastern States



Dust Explosion Test

A report on dust explosion tests has been released by the U. S. Bureau of Mines on a series of tests conducted to determine the effectiveness of various devices for venting explosion pressures harmlessly to the open air. Tests were made with closures by diaphragms, hinged panels, and several types of glass. The test was conducted in a 64-cu ft chamber with a 13 by 19-in. vent opening covered by the materials under test.

Vocational Training

On January 20 the Vocational Training and Education Committee of the National Coal Association met at the Ohio State University, Columbus, Ohio. Chairman Henry C. Woods, vice-president, Sahara Coal Co., reviewed past accomplishments, calling special attention to the questionnaires sent to operators for information with regard to their activities on educational affairs. Copies of all publications prepared by the committee were displayed and their wide distribution in schools and colleges was urged. Committee members were likewise requested to make good use of the literature and films prepared by the Bituminous Coal Institute for forwarding the objective of arousing increased interest in training for coal mining. Brief addresses were presented by staff members of the University outlining the courses offered by their departments to the students in mine engineering. The technical courses in mining were described in detail. Future meetings are planned at other colleges and universities offering courses in mining.

Mining Developments

At the annual meeting of Bituminous Coal Research, Inc., Stephen Krickovic, chief engineer of Eastern Gas and Fuel Associates and chairman of the BCR Mining Advisory Group, outlined the progress of the Mining Development Committee in evolving a basic design principle for a continuous mining machine. Test units are now being tried out underground to prove the principles.

This committee has as its fundamental objective the development of a mining machine that will combine several of the functions originally performed by the different units in the conventional mining cycle of face

International Coal Conference

An international conference on coal preparation will meet in Paris, France, June 24-29, 1950. The meeting was organized by "Charbonnages de France" and sponsored by the French Government. Subjects to be discussed include all types of coal preparation processes. Delegates will be taken on a tour through the most modern coal washing plants of French coal mines.

Convention sessions will be held partly in the new research laboratories of "Charbonnages de France" located at Verneuil, 50 km north of Paris. The laboratories are being completed on a 75-acre estate. Members of the United States coal mining industry planning to participate in the conference are urged to make early reservations at hotels in Paris.

operation. A unit now under test removes coal from the face and conveys it to the back of the machine in a continuous operation. Attention is also being given to conveying coal away from the advancing mining machine.

Mr. Krickovic pointed out the requirements of an effective continuous mining machine. In addition to reasonably continuous operation it should have flexibility to drive headings, breakthroughs and rooms, and to mine pillars under the existing room and pillar systems of mining without the use of auxiliary cutting and loading machines. The performance of the test unit must be evaluated and additional development completed before further work is undertaken to produce a machine to meet all of the specifications.

Comminution Research

To support basic research in the crushing and grinding of minerals, Stanford University has received $1000 from the Engineering Foundation of New York. The research will be carried on by A. Kenneth Schellinger of the School of Mineral Sciences faculty in the university's metallurgical laboratories. Arrangements for the grant were made by the committee on research of the AIME.

Gasification Plant Closes

On January 6, the Pittsburgh Consolidation Coal Co., closed down its large gasification pilot plant that has been operating at Library, Pa., for more than a year. The experimental work under development was being conducted jointly with the Standard Oil Development Co. with the object of speeding up the date of actual commercialization of the "coal-to-gas-to-gasoline" process.

In announcing the closure of this important pilot plant, George H. Love, president, Pittsburgh Consolidation Coal Co., stated "We have proven that the unit can operate on a coking coal and make a gas suitable for synthesis in oils and gasoline. However, the commercial prospects of financing and building a large plant to convert coal to gasoline are far less attractive today than they were when we started this work. In fact, they are so bad, from an economic standpoint, that we see no reason to carry on this particular work further at this time.

"To be successful, a plant of the type we had planned would have to have cheap coal and complete assurance of a regular coal supply. Under present circumstances the labor relations in the industry are so bad that none of these things are possible."

Concluding his statement, Mr. Love added, "With many of the normal markets for coal shrinking as other fuels are being substituted there never was a time when the need was so great for new markets for coal. But apparently commercial exploitation of research in that direction must wait until we bring a far greater degree of stability to the coal industry from a labor point of view.

"We plan to continue and even to expand our laboratory and exploratory research at Library with the hope and expectation that sometime in the not too distant future the United Mine Workers will take a more enlightened view of the entire coal situation. Then perhaps we may be justified in taking the next steps in a large scale development program looking to the commercialization of a 'coal-to-gas-to-gasoline' plant."

Iron Ore Safety

In 1949 the red ore mines division, Tennessee Coal, Iron & Railroad Co., established its best safety record. The division reduced its accident frequency rate by 55 percent as compared to 1948. There were only 7.83 disabling injuries per million man-hours worked in 1949 as compared to 17.59 per million man-hours worked in 1948.

Elements Renamed

On January 18 came the announcement from the University of California of the production of element No. 97, the heaviest substance known. It was made by bombarding curium with the nuclei of helium atoms. It was suggested by the discoverers, Dr. Stanley G. Thompson, Albert Chiorso and Dr. Glenn T. Seaborg that the new substance be called berkelium, after the university city.

At the recent meeting of the International Union in Chemistry at Amsterdam, some new names were selected for various elements. The four transuranic elements (93, 94, 95, 96) are to continue to bear the names neptunium, plutonium, americium and curium. Technetium (43) is the new name for Masurium. Promethium (61) is the new name for illinium. Astatine (85) is the new name for the element previously called virginium or helvetium. Francium (87) is the new designation for alabamine. Beryllium (4), already widely used in the United States, replaces the term glucinium. Niobium (41) is the new designation for columbium. Lutecium (71) is the new terminology for lutetium. Hafnium (72) is officially recognized. Wolfram (74) was selected as the new name for the long familiar tungsten, and protactinium (91) is now the designation for protoactinium.

Forecast for 1950

One of the most concise forecasts of the year appeared in the January *News Letter* of the Mining and Metallurgical Society of America. Donald M. Liddell, secretary-treasurer of the Society, has kindly given his permission to republish his remarks for the benefit of the readers of MINING CONGRESS JOURNAL.

"We have been reading everybody else's forecast for the year and venture to epitomize them and somewhat improve them. Food prices will come down but the farmer will have just as great an income, at the taxpayers' expense. Labor can look to great gains in take-home pay with decreased hours of labor, at the consumers' expense. Nuisance taxes will be decreased and personal income taxes will not be raised, for this is an election year, but corporate taxes will be raised to make up the difference, since only soulless corporations pay these levies. Government spending will go on at the same or an equal rate, for a balanced budget is a crime against humanity, so long as one deserving Democrat is not on the Gevernment payroll. The nations of the world will be taught economy, while we live beyond our means; they will be taught efficient agriculture production, while we have quotas and spoiled food in storage; they will be taught that tariffs are wrong for everyone but us; they will be taught to produce, while we are afraid to tackle John L. Lewis. New Admirable Crichtons, Solomons, Daniels, Nestors and Solons will appear in the State Department and will be given proper buildups in the Press, without appreciable results. Small business will be greatly aided by the Government, which will mean additional forms to fill out. Natural gas production, from the Stuffed Shirt fields, will reach figures never before equalled."

Extensive Mapping Planned

In a recent statement Secretary of the Interior Oscar L. Chapman pointed out that only about 25 percent of the United States has been adequately mapped. Approximately 50 years more will be required to complete the task at the present rate of progress. There are hopes that this time can be shortened to 20 years. This would require a gradual speed-up, involving additional funds and extra personnel.

Current mapping operations of the U. S. Geological Survey now extends throughout Alaska, the 48 states, Hawaii and Puerto Rico. Some 2000 quadrangles are in progress and approximately 500 are completed annually.

Iron Ore Survey

Announcement has been made by the Bethlehem Steel Co. of its acquisition of a tract of land near Morgantown, Pa. The area, which lies within the belt of Triassic sediments and diabase intrusions, was acquired following an airborne magnetometer survey of the Triassic belt in Pennsylvania. The survey was conducted by Bethlehem in the hope of finding additional magnetite deposits of the Cornwall-type of which there were no surface indications.

A number of magnetite deposits and prospects are known in this section of the Triassic belt, the largest of which are the French Creek deposits, eight miles to the east, and worked intermittently as late as 1928. A diamond drilling program is in progress on the newly-acquired tract.

Core drilling is being conducted by Sprague and Henwood, Scranton, Pa.

Wheels of Government

(*Continued from page* 57)

vote in CIO's Executive Board on this action was 34 to 6. The action was taken following submission of a report by a CIO Investigating Committee which found the IUMMSW to be pursuing the program and purposes of the Communist Party and thus tending to undermine the democratic goals of the CIO.

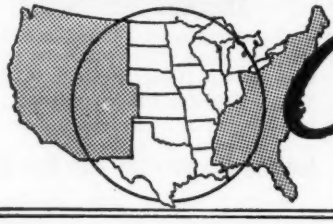
The Committee findings, in part, state:

"The leadership of Mine-Mill was warned, more than two years ago, that their devotion to the Communist Party was imperilling their status in the CIO. In 1947 a Committee of the Executive Board, headed by the same chairman as this Committee, was appointed to investigate the revolt within the Union. That Committee condemned the revolt and recommended those who had seceded from the Union should return to it and cease all activity which would tend to disrupt or injure the Union's activity. On the other hand, the Committee recommended to the leadership of the Union that it remove the Communist Party influence which had led to the revolt and that it rededicate itself to the goals of American trade unionism. The Union rejected that earlier Committee's recommendation. Its leaders have continued on their evil path. They have refused to return to the principles of American unionism and have persisted in their devotion to the alien doctrines of the Communist Party. They and they alone are responsible for the Union's present plight."

Delivered Pricing

On Feb. 28 by a vote of 240 to 144, the House of Representatives sent the O'Mahoney Delivered Pricing bill, S. 1008, back to a Senate-House conference. This action had been requested by the Senate on January 20, the delay in the House having been due to opponents of the measure who charged that the bill would legalize the old basing point system, weaken the Robinson-Patman Act, and delay development of mass production industries in the South and West. Actually provisions of the bill are designed to permit an individual producer to absorb freight charges to meet competition.

On March 2 the conferees reached agreement on a second conference report, which is not expected to come up in the House until after March 13. Agreement was made possible when Senate conferees accepted a provision approved by the Justice Department which requires that "reasonable probability" be shown in connection with charges that pricing practices are in violation of the Clayton Act.



Central States

Sub-Level Caving on the Mesabi Range

At the 11th annual mining symposium of the University of Minnesota, John J. Foucault, superintendent, Agnew and Sargent mines, the Cleveland-Cliffs Iron Co., described the application of sub-level caving to Mesabi range ores. He outlined the method in detail and listed the following advantages of the system employed: less timber required; more product per man; and lower explosive cost. Disadvantages of the system were cited as: lower recovery, dilution, disposal of waste and safety considerations.

Landreth Park Lease

A lease has been taken on a part of Landreth Park, Joplin, Mo., by Frank Fenix. The 17-acre lease runs for 10 years on the five percent royalty basis. According to the terms of the lease, milling may be done on other lands, with the tailings belonging to the owner of the land on which they are deposited. Terms call for actual mining to begin on the land within 30 days from the date of the lease, January 17, 1950.

Cuyuna Range Stripping

The M. A. Hanna Co. in connection with its winter activity on the Cuyuna iron range in Minnesota, is stripping the Onondago mine, a new property adjoining the Maroco mine on the east. An 8-cu yd, Diesel-electric dragline excavator has been assigned to do the stripping work.

Picher Residents Warned of Cave-in

In a statement issued by Elmer Isern, president, Eagle-Picher Mining & Smelting Co., the council of the city of Picher, Okla., was warned of the danger of a cave-in of the ground of the old Netta mine and that the area affected should be untenanted within 30 days. Mr. Isern stated "While no man can say with any degree of certainty as to when any given mine area will cave, we do feel that there is now sufficient evidence of possible hazard to those using the surface that we are duty bound to give warning of the hazard at this time." Final decision to move is left up to the tenant.

An area in the business center of Picher is considered the most hazardous. It is two blocks wide north and south along Main street, and one block wide on each side of the street. This area is supported underground by a large pillar reinforced by concrete. The company engineers have been watching this pillar closely and have found signs of weakening. The floor of this mine is 250 ft below the surface. Stopes in the area affected are from 80—140 ft high. Should the pillars give way there would be a considerable drop in the level of the surface.

The ground is owned by the Eagle-Picher Mining & Smelting Co. and tenants hold the surface rights under lease subject to the priority of mining operations.

Airborne Survey

At the meeting of the Minnesota section of the AIME at Duluth, Minn., on January 16, Dr. George M. Schwartz, director of the Minnesota Geological Survey, stated that a total of 62,000 sq miles had been flown with the airborne magnetometer over iron ore formations of northern Minnesota in the past three years. Additional areas will be flown this spring and the data gathered will be compiled in maps to be made available at a later date.

Kansas Mineral Output

Mineral production in 1949 from Kansas was valued at $345,000,000 in preliminary estimates made by the State Geological Survey at the University of Kansas. Earl K. Nixon, speaking for the survey, said the brick, tile, cement and stone industries, currently bringing $30,000,000 in annual income, were "bright spots in the mineral picture." He said the state's mineral production "is worth $25,000,000-$30,000,000 more than our livestock production in 1948 as reported by the State Department of Agriculture." High on the list of sources of mineral wealth was the petroleum industry which had its greatest year in Kansas with at least 78 new wells and four new gas pool discoveries.

American Zinc Institute

The thirty-second annual meeting of the American Zinc Institute will be held at the Hotel Statler, St. Louis, Mo., on Tuesday and Wednesday, April 11-12.

Indiana Preparation and Use Group

Meeting late in 1949, the Indiana Coal Preparation and Utilization Society elected R. H. Swallow, Ayrshire Collieries Corp., as president. J. S. Bond, Enos Coal Mining Co., and Roy Ault, Shasta Coal Corp., were elected vice-presidents, and C. C. Lydick, managing director, Coal Trade Association of Indiana, was reelected secretary-treasurer.

The topic "Coal: Fallacy and Fact," was discussed by Reed Moyer, assistant to the vice-president, Central Indiana Coal Co.

Drilling Committee Formed

A drilling research advisory committee has been organized by the School of Mines and Metallurgy of the University of Minnesota to assist the School of Mines in conducting research in the field of drilling.

Members of the advisory committee include Burton H. Boyum, Cleveland-Cliffs Iron Co.; Edward L. Buetner, Jones & Laughlin Ore Co.; Vincent N. Burnhart, E. J. Longyear Co.; C. E. McManus, the M. A. Hanna Co.; E. J. Perry, Oliver Iron Mining Co.; Seval Sorensen, Pickands Mather & Co.; Harry E. Walker, Atkins-Walker Co., and Paul Zinner, U. S. Bureau of Mines. Members of the committee representing the School of Mines are Thomas L. Joseph, W. D. Lacabanne, E. P. Pfleider and Donald H. Yardley.

Homestake Production Increases

Gold production of the Homestake Mining Co., Lead, S. Dak., reached prewar levels in 1949, it was revealed by tax reports filed with the State tax department. The mine produced 1,112,185 tons of gold and silver ore valued at $15,683,159 during 1949, compared with 1,275,138 tons valued at $17,068,438 in 1942 before forced shutdown by Order L-208. Production in 1948 resulted in 896,862 tons of ore with a value of $12,658,138.

Guy N. Bjorge, general manager, said that the increased production was due to the increased manpower in the mine department. Mine personnel numbered about 300 more at the end of 1949 than at the end of 1948. Total Homestake employment at the end of 1949 was about 2050.

The company paid a total ore tax of $570,921.41 last year as compared with $440,870 in 1948. The tax, which is four percent of the value of the ore mined on all except the first 100,000 tons, compared with a six percent tax payment of $943,880 in 1942.

Smokeless Fuel

In a recent announcement, Dr. M. M. Leighton, chief of the survey division, Illinois Geological Survey, announced that smokeless fuel may be made in the future from Illinois coal. Experiments have been conducted during the past year on metallurgical coke blends prepared from Illinois coals.

Dr. Leighton reported that a new market for more than 1,000,000 tons annually of Illinois coal has been found as a result of research work conducted in the blending of Illinois coals with Pocahontas coals for the manufacturer of metallurgical coke.

Another phase of the Survey's work is the thorough study of the coal resources of Illinois including information on seam thickness, quality, depth and mining conditions. This information will be of aid to coal operators in finding new reserves to replace exhausted mines.

Tri-State Research

Dr. A. P. Thompson has completed his first year in Joplin, Mo., as director of research of the Eagle-Picher Mining & Smelting Co. The general development of the resources of the company include many mineral resources besides the metals.

1950 Coal Convention

(*Continued from page* 55)

by Toastmaster E. R. Price, manager of coal properties, Inland Steel Co. and chairman of the National Program Committee. A top flight performance by headline entertainers will round out a memorable evening. You can settle the question of tickets for luncheons and the annual banquet by ordering yours in advance.

Registration forms have been distributed throughout the industry and lists have been requested of those who will attend the 1950 Coal Convention. When lists are received at the American Mining Congress headquarters, hand-lettered badges will be made up and forwarded early in April. By this stream-lined method of advance registration, those who attend will be able to more fully utilize their time in Cincinnati for convention proceedings.

Room reservations may still be made through the Cincinnati Convention and Visitors Bureau, Inc., Dixie Terminal Bldg., Cincinnati 2, Ohio. You may reach them by telephone at Parkway 3728 or 5999.

Look over the convention program and blue pencil the papers concerned with those topics of immediate interest to you. Add them up and you will find that your Program Committee has done an excellent job in bringing the coal mining industry a program of real value.

Michigan Exploration Land

Leases for iron ore exploration on state-owned land were offered at public auction in February by the Michigan Conservation Department's land division, Lansing, Mich. Ten tracts up for auction included 760 undedicated acres in Marquette County and 40 Iron County acres on which the state owns the mineral rights. Leases were awarded to the highest cash bidders. Successful bidders are required to pay state percentage basis royalties in the event minable quantities of ore are found. Leases of this type are issued for a 50-year period with extension privileges.

North Dakota Coal Mine Fire

Production was stopped by a fire in the largest underground coal mine in North Dakota during January. The fire, at the Knife River Coal Mining Co. at Beulah, caused a three-day shutdown. M. M. Mounts, superintendent of the mine, said that as a result of the fire and other factors the State faced a serious coal shortage.

Western States

Montana Mine Meet

The Mining Association of Montana will hold its biennial summer meeting on July 30-31 at the Hotel Finlen in Butte. An attendance of at least 400 is expected. Five speakers will be invited to give their views on taxes, the future of gold, mining as an investment, the relation of small mining ventures to large mining enterprises, stimulation of uranium mining and other topics of interest to those in the industry.

On the preliminary arrangements committee are O. P. Chisholm, Charles R. Brazier and Robert P. Porter, Helena; R. B. Casewell, Dillon; Dr. Francis A. Thomson of Butte; Kuno Doerr, Jr., East Helena; A. E. Haeseler, Mike Horse; R. B. Shelledy, Garrison, and Carl J. Trauerman of Butte, secretary of the association. W. R. Allen of Wise River is chairman of the resolutions committee.

Brucite Mine Nears Capacity

Basic Refractories, Inc., under the supervision of its western manager, Norman E. Hanson, is expanding operations at its brucite and magnesite properties near Luning, Nev. Much of the machinery used in the open-pit mine, and the crushing and calcining plants of Basic Magnesium during the war, is in full operation. When the output of refined brucite and magnesite products reaches peak capacity, Basic Refractories expects to meet all demands for its products west of the Mississippi. Shipment of calcined brucite to processing plants in Maple Grove, Ohio will continue. Basic Refractories owns vast deposits of brucite and magnesite in Gabbs Valley, about 18 miles north of Luning. They were recently acquired from Basic Magnesium, wartime magnesium plant. About 165 men will be employed when the mines and plants are at full operation.

Inspiration Open-Pit Output

Open-pit operations at Inspiration Consolidated Copper Company, Inspiration, Ariz., accounted for approximately 50 percent of the company's production in 1949. The other 50 percent continued to come from underground caving operations.

Several improvements were made at Inspiration in 1949. Among these was a new addition to the sulphuric acid plant that will insure Inspiration's self-sufficiency as far as future acid requirements for leaching ore are concerned. Also during the year, a new natural gas line was laid to Inspiration, and since mid-year the company's power requirements were met by generation in its own power plant, utilizing natural gas as fuel.

Inspiration's Live Oak Pit. Open-pit operations account for 50 percent of the mine production

When compared to Utah, Morenci, and Ajo, the Inspiration open-pit operation is a comparatively small one. Material is mined with 4½-cu yd electric shovels. The ore and waste are transported to the primary crusher and to waste disposal areas in 15-cu yd trucks that handle an average net load of 24 tons per truck.

Dayrock Uses Tailing Fill

Day Mines, Inc., at its Dayrock mine in Nine Mile Canyon, north of Wallace, Idaho, is filling stopes with silica tailings from its milling plant. The material is first settled in huge tanks and transferred to mine workings by gravity pipe line. All raises in the area to be filled are first made watertight, after which the sand is poured in and allowed to drain and settle. The filling solidifies quickly and the method is found to be cheaper and better than the previously-used system of stope filling. It does a better job in that it fills all small openings. It does away with the problem of dumping mine tailings into local streams and cuts down materially the use of mine timber. The process was introduced by Rollin Farmin, who came from the Grass Valley district of California where a similar method is used by the Idaho-Maryland Mines Corp.

Engineers' Day Scheduled

The Colorado School of Mines will hold its 16th annual engineers' day at Golden, Colo., on April 21 and 22. Features of the two-day meeting are exhibits, a fire-fighting demonstration, awarding of three scholarships to Colorado high school students who can meet the requirements for entrance to the Colorado School of Mines, and a mucking and rock drilling contest.

New Lead Development

Consolidated Yukeno Mines at Keno Hill, Yukon Territory, has reported development of a new ore body said to assay 20 percent lead and 50 oz of silver per ton of milling ore. On one section of the company's 30 sq mile tract, operations are being conducted on a vein said to measure approximately 1500 ft long and 30 ft wide. Ore reserves at the present rate of production are estimated to be sufficient for 10 to 15 years.

Plans are being drawn up for the construction of a mill with the original work to begin in the fall of 1950.

COLORADO MINING ASSOCIATION ANNUAL MEETING

Head table at the famed "Sow Belly Dinner"

MINING men gathered in Denver February 2-4 to attend the 53rd annual convention of the Colorado Mining Association. The opening session started with a discussion of industrial insurance and workmen's compensation. A. H. Zeilinger, superintendent of the safety department of the Colorado Fuel & Iron Corp., presented an address "Safety from the Top Down." James P. Bradley, vice-president, Bradley Mining Co., depicted the current situation in tungsten and antimony.

Oscar Johnson, president of the Idarado Mining Co., presided over the session on mine taxation where James Hogle spoke on mine taxation. Miles P. Romney, exploration engineer for the U. S. Smelting Refining and Mining Co., delivered a paper pointing out that the lack of incentive has been a major factor in limiting exploration for new ore deposits. Evan Just, editor, *Engineering & Mining Journal*, forcefully pointed out essential factors required to perpetuate the mining industry. He said ". . . without adequate incentive the mining industry can look forward to continual degradation to the status of becoming a government ward."

Joseph Stagg Lawrence, consultant to the Gold Producers Committee of the American Mining Congress and vice-president, Empire Trust Co., spoke at the luncheon meeting on Thursday, relating the important recent events affecting gold.

The afternoon was given over to a discussion of public land problems and various phases of oil shale production were discussed in the evening. Uranium was given thorough treatment on Friday morning in a series of comprehensive papers.

The Friday luncheon group heard George E. Diggory, superintendent of industrial relations for the Colorado Fuel & Iron Corp., and an account of employer-employe relations at the New Park Mining Co. by W. H. H. Cranmer, president. In the afternoon Philip M. McKenna, national chairman of the Gold Standard League spoke for the convertibility of gold at $35. Harry Sears, representing the California Gold Committee, supported the need for a free market price for newly-mined gold.

Devaluation and its effect upon the lead and zinc mining industries was thoroughly discussed by Felix E. Wormser, vice-president, St. Joseph Lead Co. He ably pointed out how the devaluation of foreign currencies permitted foreign producers of lead and zinc to place their products on the U. S. market and realize a higher profit than possible before devaluation. Mr. Wormser outlined a sliding scale of tax or tariff on imports that would offer domestic producers a measure of protection from low cost foreign metals despite market price fluctuations.

The various problems of copper, lead and zinc mining were given consideration by J. H. Buchanan, Joseph H. Taylor, W. W. Lynch, Miles Romney, Richard Young, W. E. Burleson, and Burt B. Brewster. Edward H. Snyder, president, American Zinc Institute and president, Combined Metals Reduction Co., summarized the proceedings. He stated that price is a prime problem; that the price is seriously affected by foreign lead and zinc and that imports should be curbed. He spoke of the general agreement of the mining industry on the question of tariffs and taxes and remarked that a long time and a tough battle would be required to obtain the necessary protection. He urged the industry to immediate action in starting both programs now. Speaking of S. 2105, Mr. Snyder said that only small tonnages of metal would be affected and that, as the bill provides for contracts between the Government and private parties, there would not be Government control of the mining industry.

The traditional Gold and Silver

Banquet took place in the Lincoln Room of the Shirley-Savoy Hotel on Friday evening, with Frank A. Wardlaw, Jr., general manager, International Smelting and Refining Co., presiding as toastmaster. Major General Rainey of the U. S. Air Force outlined the functions of the Strategic Air Force of the United States and how it would act at the time of an emergency.

On the last day of the session, new developments in drilling were discussed by a series of able speakers. Cost cutting came in for proper consideration at the session presided over by Harlan A. Walker, assistant general manager, Homestake Mining Co. Innovations that have been of material help to the Climax Molybdenum Co. were described by C. J. Abrams. Carlos Bardwell described recent steps taken to reduce smelting costs. Fred O. Davis, vice-president and treasurer, Potash Company of America, gave an account of the recent strike at Carlsbad and the manner in which it came to an end.

At the luncheon meeting, V. L. Mattson, director, Colorado School of Mines Research Foundation, Inc., noted recent research developments in a comprehensive paper covering many fields. John D. Sullivan, assistant director, Battelle Memorial Institute, spoke on "Minerals' Debt to Man." Harold Worcester presided over a geological session held on Saturday afternoon. After the close of the technical program, which included a group of informative papers on nonmetallics, new officers of the association who will serve in 1950 were introduced as follows: John Hamm, president; Merrill E. Shoup, first vice-president; Harrison S. Cobb, second vice-president; Charles Chase, third vice-president; Blair Burwell, fourth vice-president; E. D. Dickerman, fifth vice-president; H. C. Prommel, treasurer; and R. S. Palmer, executive secretary.

Arizona Copper Project

Miami Copper Co. is negotiating with the Reconstruction Finance Corporation for a loan to assist in the development of a $13,000,000 copper project in the Globe-Miami district of Arizona. The claims involved include the holdings of the old Louis d'Or Mining Co., plus some additional claims in the Sleeping Beauty District, east of Miami.

It is proposed to form the Copper Cities Mining Co., a subsidiary of Miami Copper Co., to conduct the operation. Total cost of the development is estimated at $13,000,000, only a portion of which is to be borrowed from the RFC.

Plans call for the use of open-pit methods to mine the 30,000,000-ton ore body, approximately the size of Castle Dome, another subsidiary of Miami Copper Co. which was opened during the war with RFC assistance. Estimated costs include those of capitalization, stripping, and moving the Castle Dome concentrator to the new location, a distance of eight miles.

Exploratory work has been in progress for some time, and Robert W. Hughes, general manager of Miami Copper Co. states that approximately three years will be required to bring the ore body into production. It is believed that the new copper mine can be on a production basis by the time the Castle Dome Mining Co. has exhausted its ore deposit. Reports indicate that both the Castle Dome and Red Hill deposits will have been mined out by 1954. By starting actual development of the new deposit at an early date both equipment and personnel can be transferred to the new operation at a material saving in cost. Work on uncovering the Copper Cities ore body is to begin as soon as the loan is approved.

Central Eureka Plans Deep Development

At Sutter Creek, Calif., the Central Eureka Mining Co. is planning to develop to a vertical depth of 4300 ft. The three-compartment Central Eureka shaft, now 3200 ft deep, will be sunk an additional 1100 ft if stockholders approve of plans.

Mining below the 3200-ft level is carried on through a single-compartment winze approximately 600 ft deep. The company reported that October 1949 operations earned a profit of $18,244, contrasted with a monthly loss approximating $29,000 during the first quarter of 1949. Operations are largely centered on the 3600-, 3700-, 3800- and 3900-ft levels. Two hundred tons of ore are milled daily and 160 men are employed.

Sunshine Hits Uranium Vein

The Sunshine Mining Co., after several months of shaft sinking followed by lateral drift work, has intercepted the Free Enterprise vein at the 150-ft level on the Free Enterprise property near Boulder, Mont. Minerals contained in the vein are silver, lead and uranium. The present vein, now exposed at the 150-ft level for the first time, is one of several that may be serviced by the present shaft.

Artillery Peak Exploration

Four and possibly five 10 by 10-ft drifts will be driven by the U. S. Bureau of Mines in its exploration of the Artillery Peak manganese deposit in southern Mohave County, Ariz. This part of the program should be started within several months.

So far, the principal work has been camp construction and diamond drilling. One drill hole has been completed and three more are to be drilled. Camp facilities include a large mess hall, three barracks, staff house, office, tool house, and change room. The drill contract is held by Jones Drilling Co. of Dallas, Tex.

One 600-cu ft compressor has been received and another is on order. An electric power plant is on the ground, and a mucking machine, an electric motor for haulage, together with track and switches, are scheduled for delivery this month.

Charles A. Kumke, mining engineer with the Bureau of Mines at Tucson, Ariz., is in charge of the project. Charles K. Rose is resident engineer.

Mercury Producer Finished

Early in December 1949, the Bonanza mercury mine near Sutherlin, Ore., closed down with little likelihood of ever reopening. The first production from the Bonanza mine came shortly after discovery in 1865. In 1940 the output was about 500 flasks a month. At present, only the Mt. Jackson mine in Sonoma County, Calif., is producing, and closure is anticipated at an early date.

New Ore in Hercules

A new discovery of commercial grade silver-lead ore has been made on the 1000 level in the old Hercules mine at Burke, Idaho, according to Day Mines, Inc. The vein was found in a previously unexplored area. In 1922 the Hercules mine suspended operations when a major fault terminated the ore body on its strike and the downward extension was found to be replaced by iron as far as prospected below the 1000-ft level.

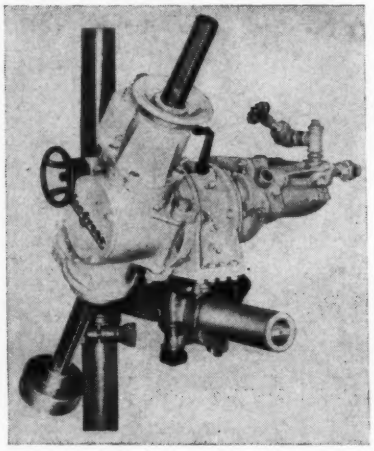
Spokane-Idaho Deepens Shaft

With completion of the station on the 1400-ft level of the Constitution mine of the Spokane-Idaho Mining Co., on Pine creek in the Coeur d'Alene district of Idaho, sinking operations on the final 200 ft of the shaft deepening program have been started. New levels have been established on the 1200 and 1400-ft levels. The 170-ton mill is running to capacity with about 90 men employed at present.

Manufacturers Forum

High-Speed Core Drill

A "Hi-Speed Prospector" core drill has been developed by the E. J. Longyear Co., Minneapolis, with a two-speed transmission that permits the operator to shift into low gear when



drilling broken or hard formation, and at the same time employ the full power of the duplex air motor.

The new drill is adapted for underground use in coring and for drilling blast holes, and holes for ventilation or drainage, electric cables and for grouting purposes. The new drill weighs 275 lb complete. It has a capacity of 500 ft of 1½-in. hole.

When to Sharpen Bits

To educate mining machine operators to derive the maximum productive use from carbide-tipped coal cutter bits, the Carboloy Co., Inc., places a "decal" on the side of the bit. Instructions on the decal show visually the appearance of the bit when it has reached the point of requiring sharpening.

Penetrating Lubricant

A lubricant-base penetrating oil compound for positive penetration of rusted or "frozen" metal parts has been announced by the Ensign Products Co., Cleveland, Ohio. The penetrant is said to be one of the few penetrating oils to contain no kerosene. It may be sprayed or dripped over the parts to be loosened or the parts may be dipped or soaked in the oil.

The new compound called Ensign 318 Pen-a-trate is reported to be useful in speeding disassembly of machinery and equipment as well as useful before assembly to assure smooth snug entries and tight fits while guarding against rust and corrosion. A trial sample and additional information may be obtained upon application to the company.

Tracked Digger

A Dempster-Diggster is now available with crawler type traction as well as an automotive unit on rubber-tired wheels. Dempster Brothers, Inc., Knoxville, have available their "CR" Model 100 Diggster which features hydraulic crowd and hoist. The unit may be equipped with either 1, or 1¼-cu yd digging buckets or 1½- and 2-cu yd buckets for handling loose materials.

Silver-Zinc Storage Battery

An alkaline storage battery utilizing silver and zinc as active materials has been developed by the Yardney Electric Corp., New York 7, for industrial and other use. The "Silvercel" battery is designed for great resistance to mechanical shock. There are no plates or separators in the unit. Battery construction is said to eliminate hazards of leakage and spilling, and the cell is reported to be able to withstand heavy discharges without damage. Corrosive and poisonous fumes are absent during charging or discharging.

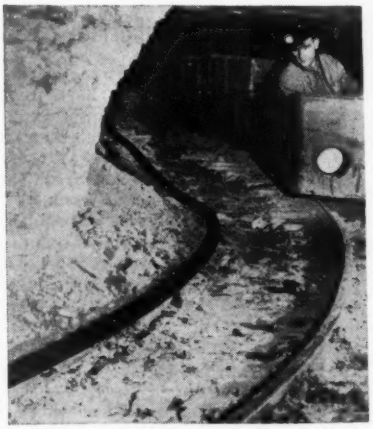
X-ray Microscope

An X-ray microscope, which makes visible internal details of materials through which light cannot pass, has been developed by scientists of the General Electric Co. They said that future refinements of the X-ray microscope, at present in the laboratory stage of development, may result in much sharper images and higher magnifications than are possible using visible light. Clear, sharp X-ray images, magnified ten times, have been produced in the laboratory, and these images have been magnified ten times further by photographic enlargement without serious loss of detail. Objects studied to date have been fine mesh screens.

The microscope operates on the principle that X-rays can be reflected from polished surfaces, as can visible light, provided that they strike the surfaces at very small angles, almost parallel to the surfaces. It consists of an X-ray tube and a pair of curved mirrors, which the X-rays strike at an angle of less than one-half degree. The mirrors bend the rays to form a magnified X-ray image on a photographic film.

Pipe for Corrosive Waters

Carter Products Corp., Cleveland 5, has announced completion of pilot installations of Carlon "E" plastic pipes developed to handle highly corrosive waters. More than 6000 ft of this pipe has been under severe tests in



three of the country's largest mines. After more than 20 months of service no sign of wear or deterioration was shown from acid mine water. The extruded Carlon pipe features lightweight, flexibility and corrosion-proof characteristics. A 100-ft. length of 2-in. diam Carlon "E" weighs approximately 90 lb and can be handled by one man.

Bit Attachment

To match the performance of its Carset Jackbits, Ingersoll-Rand Co., Phillipsburg, N. J., has developed an attachment designed primarily for use with tungsten carbide bits. The attachment is of the shoulder type employing a patented 38-deg, reversible-buttress thread. It was developed to resist shock and impact while still preventing slippage, excessive thread wear, or loss of drilling speed. According to the company, the threads on the attachment are designed to last for the life of the bit.

Power Transmission

Torque-Arm speed reducer is the term applied to the newest addition to the line of power transmission equipment of the Dodge Manufacturing Corp., Mishawaka, Ind. The unit mounts directly on the shaft to be driven and, according to the manufacturer, eliminates the necessity for special engineering. The Torque-Arm speed reducer is designed primarily for conveyors, bucket elevators, feeders, and similar machinery.

The unit consists of a reducer with a fixed ratio of 15 to 1, driven by a motor through any V-belt or flat belt drive. Any desired output speed from 13 to 133 rpm may be obtained through the use of stock sheaves. The new Torque-Arm speed reducer is made in six sizes with capacities up to 28.5 hp.

Powerline Warning Device

A safety warning device has been designed to prevent accidents while working in congested areas around power lines with heavy equipment having booms. The device is being marketed by the Electro-Alarm Sales Co., Omaha 2, Neb.

In operation, the unit warns operators of danger in the 10,000 v range at a distance of 75 ft. It is said to be sensitive to voltages from 110 up, and allows proximity warnings from 4-200 ft.

Spiral Set Diamond Drill Bits

Core Laboratories, Inc., Dallas, Texas, produces a spiral-set diamond drill bit designed to assure maximum cutting efficiensy and to control diamond wear. The diamonds are set so that not more than half of the leading edge of each diamond will cut the formation with the object of obtaining a smooth shearing of the formation and longer bit usefulness. A variety of bit sizes are available and may be had set in either special tungsten carbide matrix for tough drilling or a powdered metal matrix for soft formations.

Bulldozer Scraper

A bulldozer blade attached to the Model D Roadster Tournapull has been announced by R. G. LeTourneau, Inc., Peoria, Ill. The dozer blade is suspended in front of the Tournapull and is electrically controlled by a switch mounted on the dash control panel. When so equipped, the D Roadster Tournapull scraper may be used as a dozer or scraper without consuming time in changing from dozer to scraper operation.

— *Announcements* —

Harry J. Anderson has been promoted to manager of the exhibit section of the advertising division of U. S. Steel Corp. of Delaware.

Harold H. Indestad is now in the Allis-Chalmers' Charleston, W. Va., district office to give special attention to sales of products of the basic industries department.

James D. Lowe was recently appointed wire and cable specialist for the construction materials department of General Electric Co.

John McVeigh has been appointed a special development engineer by Kennametal Inc., Latrobe, Pa., to the research staff engaged in extending the application of Kentanium.

Carl F. Norberg was elected executive vice-president of the Electric Storage Battery Co. He was formerly vice-president in charge of manufacturing since 1944.

John Shaw, director of safety of Hercules Powder Co., retired on January 1 after nearly a half century of devoting his efforts to standardizing chemical operating procedures and use of safety equipment to prevent industrial accidents.

The **Johnson-March Corp.** has announced a change of address—a new location at 1724 Chestnut Street, Philadelphia 3, Pa.

Myron R. Coughenour has been appointed engineering manager of the **Connellsville Manufacturing and Mine Supply Co.** He succeeds **W. L. Pritte, Jr.**

Robert H. Davies recently joined the **Baker-Raulang Co.** as manager of engineering.

Merle V. Lashey has been promoted to the position of assistant chief engineer in charge of large shovel design for the Marion Power Shovel Co., Marion, Ohio. He succeeds the late Glenn B. Heffelfinger.

CATALOGS AND BULLETINS

CUTTING, LOADING AND TRANSPORTATION. *Goodman Manufacturing Co., Chicago 9, Ill.* A series of new generously illustrated bulletins covering the field of cutting, loading and conveying operations are now available upon request. Specifically, these informative publications deal with Goodman shortwall coal cutters, the 660 tractor tread loader, the L-20 shaker conveyor drive, cable reel shuttle cars, and belt conveyors. Installation and layout plans in most of these bulletins offer a real service to the operator in designating the most effective application of the equipment.

DIAMOND DRILL BITS. *Wheel Trueing Tool Co., Detroit, Mich.* A recently published drill bit catalog contains detailed information and specifications on various types of coring and non-coring bits employed in all types of drilling operations. A section of the new bulletin gives diamond coring instructions and many hints that aid in obtaining maximum efficiency from diamond drill bits. Copies of the catalog may be obtained from the manufacturer.

FILTRATION. *Oliver United Filters, Inc., New York City.* Two new publications, one covering the horizontal rotary filter, and another on the American disc-type continuous filter, are available.

The horizontal rotary filter utilizes the force of gravity to dewater. Methods of application and a full description of the equipment is included in the publication.

ROOF BOLTING EQUIPMENT. *Joy Mfg. Co., Pittsburgh 22, Pa.* A new 12-page bulletin describes the equipment required and methods used in this system of roof support. A section on requirements is included which helps determine the selection of the drilling equipment most suited to specific conditions. Line drawings and photographs illustrate the equipment and methods described. Specifications for air compressors, drills, bolt drivers, and nut tighteners are included.

SCREEN CONVERSION SLIDE TABLE. *McNally-Pittsburg Mfg. Corp., Pittsburg, Kans.* A small pocket size slide table condenses conversion data for punched screen plate, wedge wire screen, and screen wire mesh. Data is correlated for inches, millimeters, U. S. wire mesh, and Tyler wire mesh. Each measure can be converted to decimal inches and microns. The slide ranges from one inch to 400 mesh. It is available free from the company.

SMALL SCALE REDUCTION. *American Pulverizer Co., St. Louis 10, Mo.* A colorful six-page bulletin, "For Better Testing and Small Scale Reduction," describes practical applications of the company's laboratory crushers, grinders, and shredders for the reduction of coal, by-products, chemicals, clays and other products. Copies of the bulletin may be had upon request.

UNDERGROUND COMMUNICATION. *The United States Instrument Corp., Summit, N. J.* In a new catalog, this manufacturer announces a new line of sound-powered telephones for industrial and mine use. The stations described operate without batteries or any outside power for either talking or ringing circuits.

— *Index To Advertisers* —

THE OIL[illegible]
THAT N[illegible]ER FORGETS!

When a Gardner-Denver L012 L[illegible] Oiler runs out of oil—it automatically shuts off the flo[illegible] of air through the line. No chance for drill or other [illegible]ools to [illegible]run dry! You save oil, too, with the L012. A meteri[illegible] pin accurately regulates the flow of atomized oil—makes each fi[illegible]ng last longer. The L012 operates equally well in any position—can be filled without stopping the work. For positive lubrica[illegible]—feed the oil by air with a Gardner-Denver Line Oiler. W[illegible]te today for complete information.

Gardner-Denver L012 Automatic Line Oiler—for any tool using 25 to 500 cubic feet of air per minute. Oil capacity—one pint.

OTHER GARDNER-DENVER LINE OILERS

Models L07, L08 and L09

Models L011 and L014

Model	L07	L08	L09	L011	L0114
For Air Flow (Cu. Ft. per Min.)	75-450	35-200	10-75	75-450	75-450
For Use with	Large Drills	Small Drills	Air Tools	Wagon Drills	Mine Car Loaders

GARDNER-DENVER *Since 1859*

Gardner-Denver Company, Quincy, Illinois
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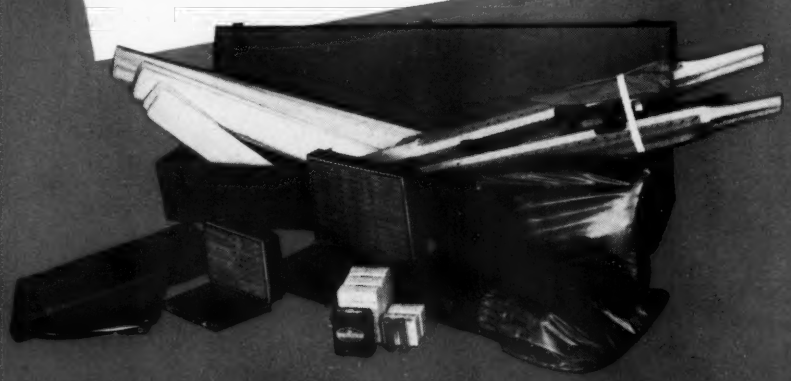
In the training and practice of **BETTER FIRST AID**

MSA

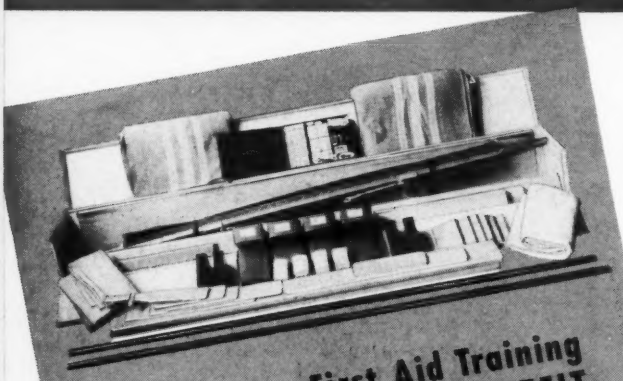
SAFETY EQUIPMENT HEADQUARTERS

FIRST AID EQUIPMENT



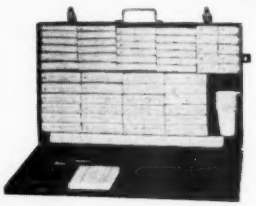
M·S·A EMERGENCY FIRST AID OUTFIT

Especially adapted for easy transportation in the mine and for storage at the working face, this equipment is a complete emergency outfit in a durable steel case. The contents include a folding stretcher which opens quickly to full-size army type, two complete first aid kits, blankets, splints, and Redi-Heat Blocks. The sturdy 20-gauge steel case is equipped with an extra heavy, tight-fitting lid and a rubber gasket which keeps contents dry and free from dust and mildew. The case is furnished with strong handles at both ends and a bracket for horizontal mounting. Overall dimensions, 56" x 12⅝" x 8". Write for Bulletin 103.



. . . and for First Aid Training THE M·S·A CONTEST OUTFIT

A complete unit of equipment for first aid training and contests, this outfit provides the complete list of materials recommended by the U. S. Bureau of Mines for first aid practice and contest work, contained in a strong steel box which is easily transported. The box, which is finished in white, is made of 24-gauge steel, and is equipped with a strong handle at each end. The M. S. A. Contest Outfit aids neatness and efficiency, prevents loss of materials. Write for details!



M·S·A MINERS FIRST AID CABINET

This completely-equipped cabinet contains a large assortment of first aid materials and supplies meeting the needs of mine hospitals or dressing stations. The contents conform to materials recommended by the United States Bureau of Mines for first aid treatment. The sturdy steel case is designed for wall mounting, or transportation when required. Bulletin FA-74.

M·S·A ALL-WEATHER FIRST AID K

Providing dependable protecti against dust, dirt and moisture assortments of unit-packaged first materials, M. S. A. All-Weather F Aid Kits feature strong steel ca with replaceable rubber gasket wh seals edges tightly when kits are clos The unit packages contain one more treatments for single inju without waste. Kits are available 10-, 16-, 24-, and 36-unit sizes. letin FA-101.

M·S·A REDI-HEAT BLOCK

Using replaceable Redi-Heat charges this unit provides quick, safe emergency heat for first aid applications. Always ready for immediate use, the M. S. A. Redi-Heat Block employs no liquids. The charges are unaffected by external conditions and have unlimited storage life. Bulletin FA-92.

MINE SAFETY APPLIANCES COMPANY

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